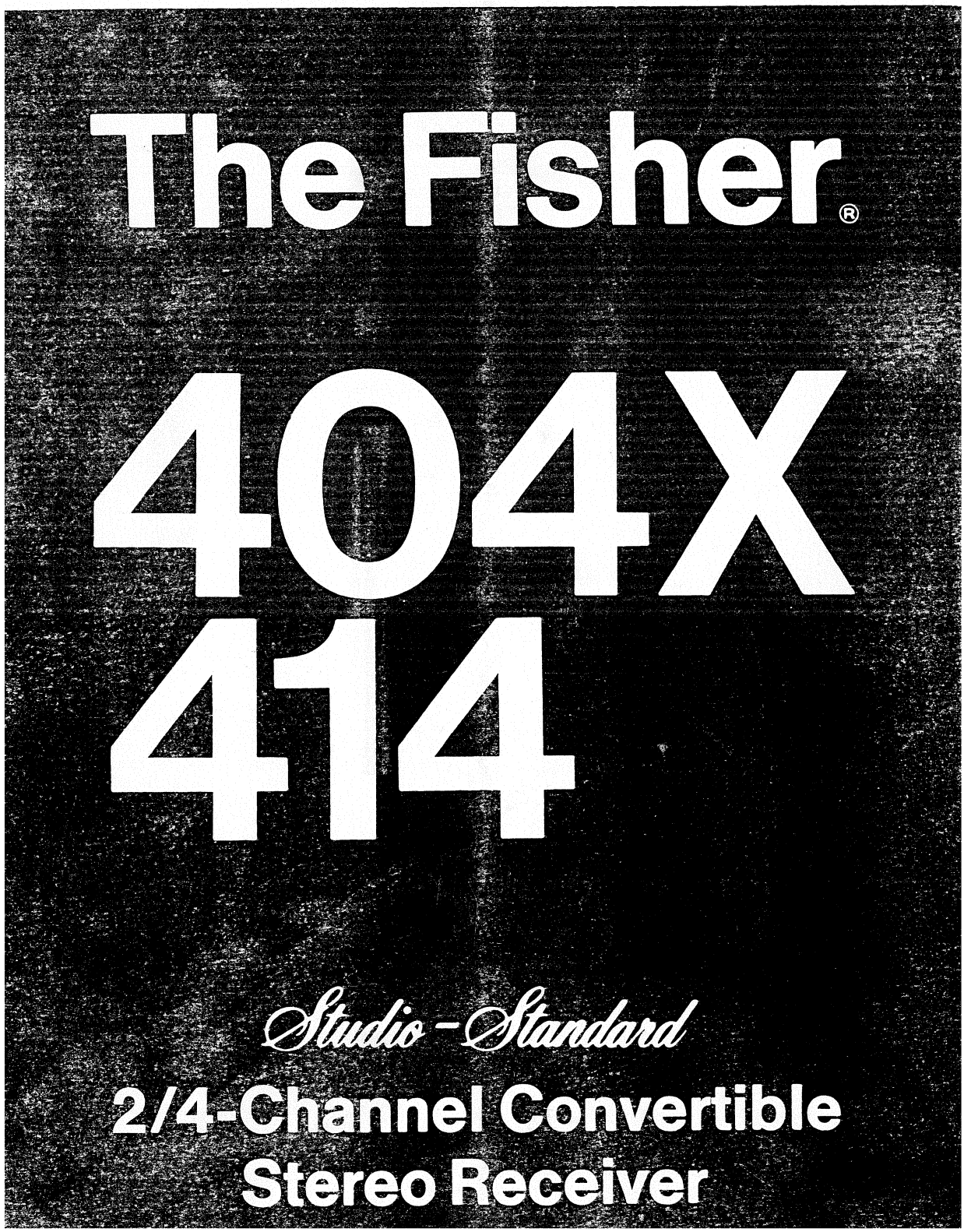
SERVICE MANUAL



WORLD LEADER IN HIGH QUALITY STEREO

TEST EQUIPMENT and SERVICE TIPS

The following equipment is required to completely test and align the Receiver:

- Line Voltage Autotransformer or Voltage Regulator
- DC Vacuum Tube Voltohmmeter
- Accurately Calibrated AC Vacuum Tube Voltmeter
- Oscilloscope (Flat to 100 kHz Minimum)
- Low-Distortion Audio Sine-Wave Generator
- Harmonic Distortion Analyzer
- 4 Load Resistors, 4-Ohms, 250 Watts (Minimum Rating)
- Low-Distortion AM-FM Signal Generator
- 10.7 MHz Sweep Generator (Fisher 3024*)
- Multiplex Generator (Fisher 1536*)
- 455 kHz Sweep Generator (Fisher 3025*)
- Soldering Iron with Small Tip, Fully Insulated from AC Line
- Suction Desoldering Tool
- Sound Source and Speakers for Listening Tests

*Requires Power Supply (Fisher 1561)

CAUTION: **This precision high-fidelity instrument should be serviced only by qualified personnel, trained in the repair of transistor equipment and printed circuitry.**

Many of these items are included only as a reminder – they are normal procedures for experienced technicians. Shortcuts may be taken, but these often cause additional damage to transistors, circuit components, or printed circuit boards.

SOLDERING: A well-tinned, hot, clean soldering iron tip will make soldering easier, without causing damage to the printed circuit board or the components mounted on it. Regular use of a sponge cleaner will maintain a clean soldering surface. The heat available at the tip, (not the wattage of the iron) is important. Some 50-watt irons reach temperatures of 1,000° F, while others will hardly melt solder. Small-diameter tips should be used for single solder connections, pyramid and chisel tips for large areas.

Always disconnect the AC power cord from the line when soldering. Turning the power switch OFF is not sufficient. Power-line leakage paths, through the heating elements of the iron, may destroy transistors.

PARTS REMOVAL: If a part is not being returned for in-warranty factory replacement, it may be cut in half (with diagonal cutting pliers) to make removal easier. Multiple terminal parts, such as IF transformers, or electrolytic capacitors, should be removed using special de-soldering tips made especially for this purpose. Removing solder from terminals, reduces the possibility of breaking the printed circuit board when the part is removed.

ACCIDENTAL SHORTS: A clean working area, free of metal particles, screws, etc., is an important preventive in avoiding servicing problems: Screws, removed from the chassis during servicing, should be stored in a box until needed. While a set is operating, it takes only an instant for a base-to-collector short to destroy a transistor (and others direct-coupled to it). In the time it takes for a dropped screw, washer, or screwdriver, to contact a pair of terminals (or terminal and chassis), a transistor can be ruined.

SOLID-STATE DEVICES: Integrated Circuits contain the equivalent of many circuit parts, including transistors, diodes, resistors, and capacitors. The preferred troubleshooting procedure requires isolating the trouble to one stage using AC signal tracing methods. Once the suspected stage is located the DC voltages at the input and output leads are measured to give an accurate indication of the operating conditions of the IC. DO NOT use an ohmmeter, to check continuity with the IC mounted on the printed circuit board. Forward biasing the internal junctions within the IC may burn out the transistors. Do not replace a defective IC until all external resistors, capacitors, and transformers are checked first, to prevent the replacement IC from failing immediately due to a defect in the connecting components. Solder and unsolder each lead separately using a pliers or other heat sink on the lead to prevent damage from excessive heat. Check that the leads are connected to the correct locations on the printed circuit board before turning the set on.

Whenever possible, a transistor tester should be used to determine the condition of a transistor or diode. Ohmmeter checks do not provide conclusive data, and many even destroy the junction(s) within the device.

Never attempt to repair a transistor power amplifier module until the power supply filter-capacitors are fully discharged.

If an output or driver transistor becomes defective (opens or shorts), always check ALL direct-coupled transistors and diodes in that channel. In addition, check the bias pot., and other parts in the bias network, before installing replacement transistors. All output and driver transistors in one channel may be destroyed if the bias network is defective. After parts replacement, check bias for specified idling current.

In some applications, replacement of transistors must be made from the same beta group as the original type. The beta group is indicated by a colored marking on the transistor. Include this information when ordering replacements.

When mounting a replacement power transistor, be sure the bottom of the flange, mica insulator, and the surface of the heat sink, are free of foreign matter. Dust and grit will prevent flat contact, reducing heat transfer to the heat sink. Metallic particles can puncture the insulator, cause a short, and destroy the transistor.

Silicone grease must be used between the transistor and the mica insulator and between the mica and the heat sink for best heat transfer. Use Dow-Corning DC-3, or an equivalent compound made for power transistor heat conduction.

Use care when making connections to speakers and output terminals. To reduce the possibility of shorts, lugs should be used on the exposed ends, or stranded wire should be tinned to prevent frayed wire ends. Current in the speakers and output circuitry is quite high – poor contacts, or small wire, can cause significant power losses. For wire lengths greater than 30 feet, 16 AWG, or heavier, should be used.

VOLTAGE MEASUREMENTS: All voltages are measured with the line voltage adjusted to 120 volts. All measured voltages are ± 20%. DC voltages are measured to chassis with a VTVM, with no signal input unless otherwise noted. AC signal voltages are measured under the conditions specified on the schematic.

ALIGNMENT PROCEDURES: DO NOT attempt realignment unless the required test equipment is available, and the alignment procedure is thoroughly understood.

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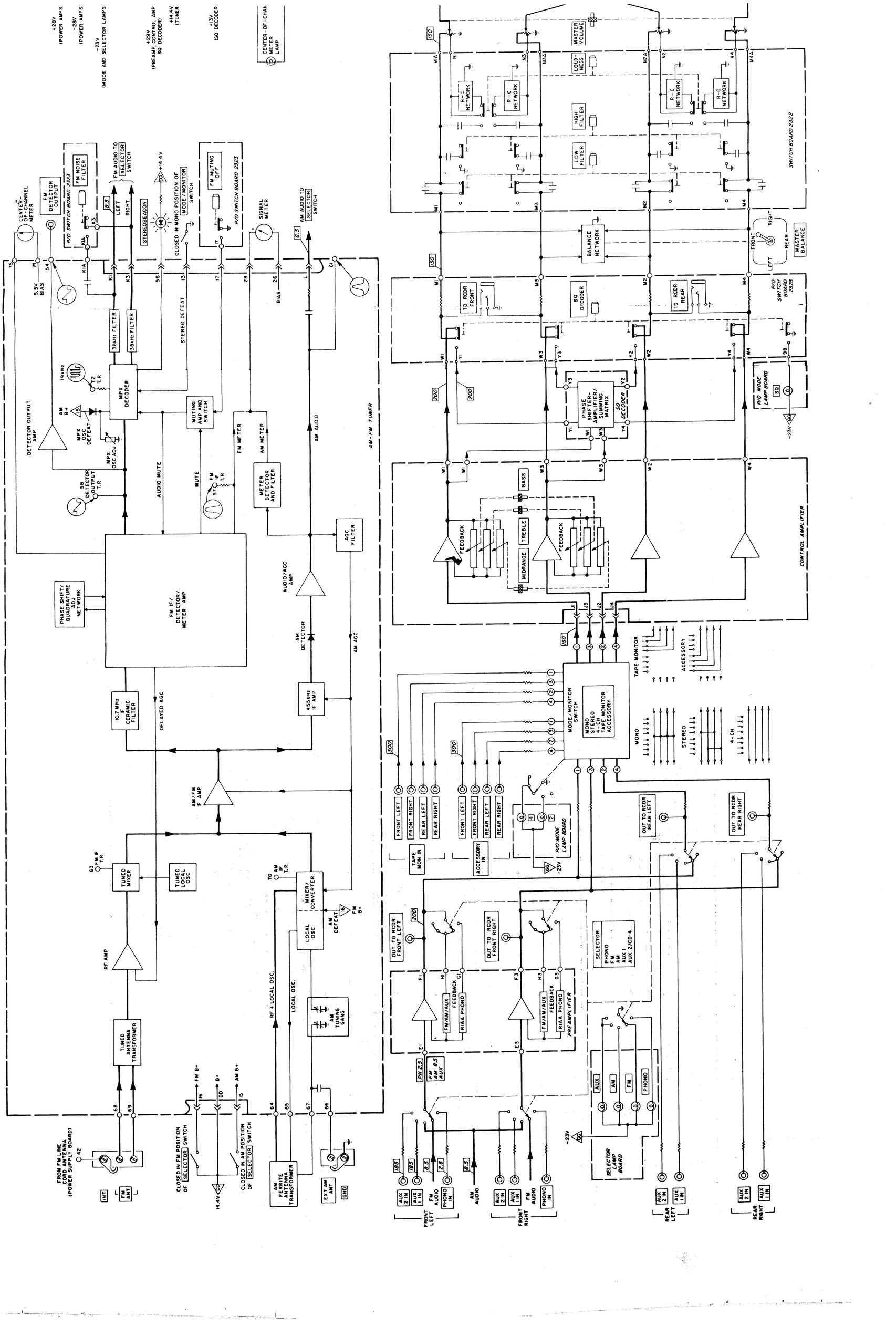
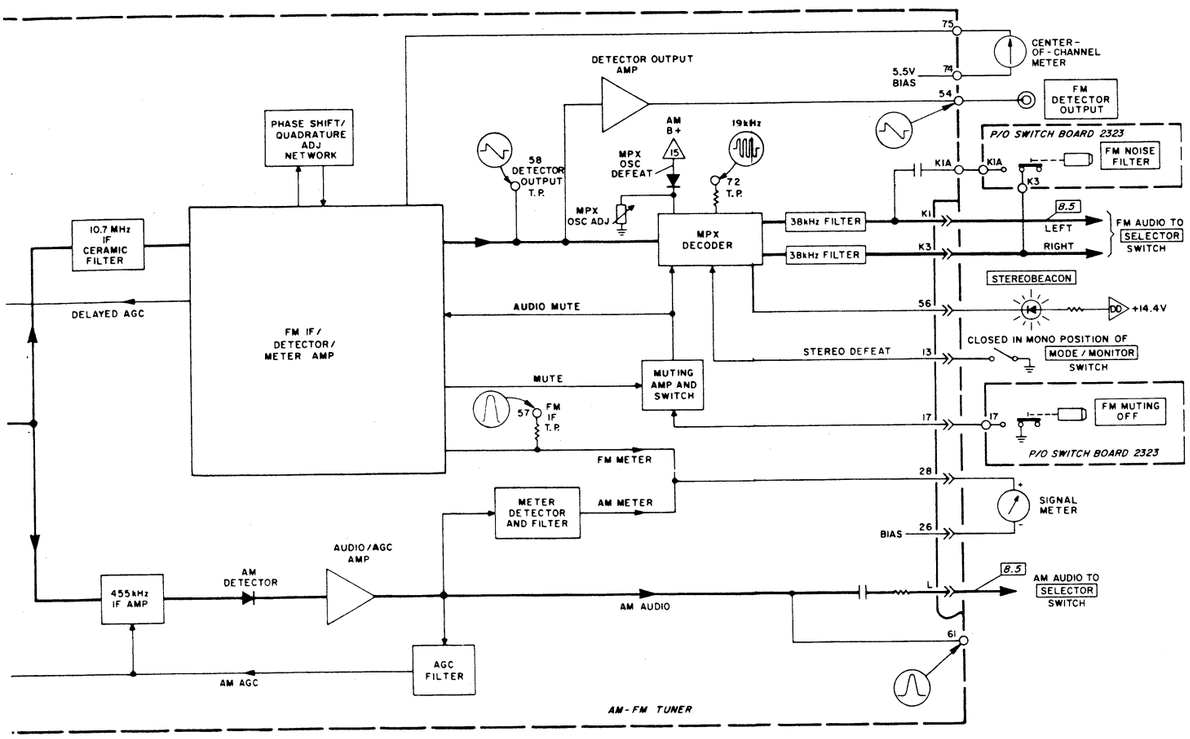
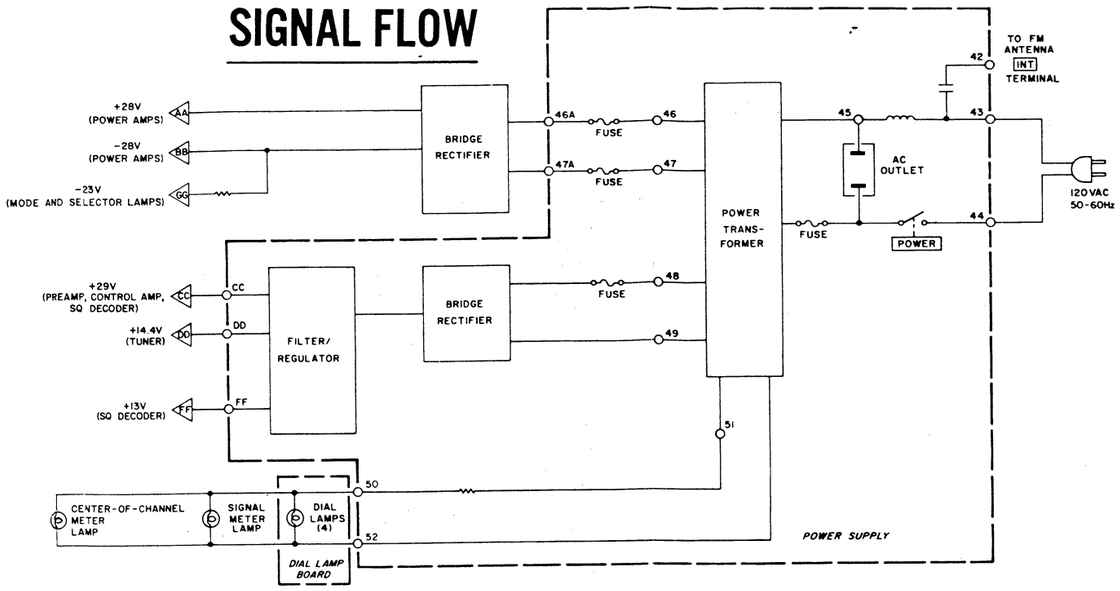
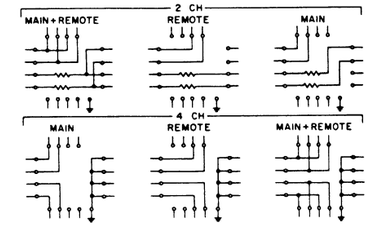

+28V (POWER AMPS)
-28V (POWER AMPS)
-23V (MODE AND SELECTOR LAMPS)
+29V (PREAMP, CONTROL AMP SQ DECODER)
+14.4V (TUNER)
+13V (SQ DECODER)
CENTER-OF-CHANNEL METER LAMP
CENTER-OF-CHANNEL METER
FM DETECTOR OUTPUT
P/O SWITCH BOARD 2323
FM NOISE FILTER
FM AUDIO TO SELECTOR SWITCH
LEFT
RIGHT
STEREO BEACON
CLOSED IN MONO POSITION OF MODE/MONITOR SWITCH
FM MUTING OFF
SIGNAL METER
AM AUDIO TO SELECTOR SWITCH
5.5V BIAS
STEREO DEFEAT
BIAS
38kHz FILTER
19kHz
T2 T.P.
MPX DECODER
AM BAL
MPX OSC DEFEAT
MPX OSC ADJ
DETECTOR OUTPUT AMP
SG DETECTOR OUTPUT T.P.
AUDIO MUTE
MUTE
MUTING AMP AND SWITCH
FM IF T.P.
FM METER
AM METER
METER DETECTOR AND FILTER
AM AUDIO
AGC FILTER
AUDIO/AGC AMP
AM DETECTOR
AM AGC
455kHz IF AMP
AM/FM IF AMP
DELAYED AGC
10.7 MHz IF CERAMIC FILTER
FM IF/ DETECTOR/ METER AMP
PHASE SHIFT/ QUADRATURE AM NETWORK
AM-FM TUNER
63 FM IF T.P.
TUNED MIXER
TUNED LOCAL OSC
RF AMP
TUNED ANTENNA TRANSFORMER
70 AM IF T.P.
MIXER/ CONVERTER
LOCAL OSC
AM DEFEAT
FM B+
RF + LOCAL OSC.
LOCAL OSC.
AM TUNING GANG
AM FERRITE ANTENNA TRANSFORMER
EXT AM ANT.
GND
FROM FM LINE CORD ANTENNA (POWER SUPPLY BOARD)
INT
FM ANT
CLOSED IN FM POSITION OF SELECTOR SWITCH
CLOSED IN AM POSITION OF SELECTOR SWITCH
14.4V
FM B+
B+
AM B+
CONTROL AMPLIFIER
SWITCH BOARD 2322
P/O SWITCH BOARD 2323
MASTER VOLUME
LOUDNESS
HIGH FILTER
LOW FILTER
BALANCE NETWORK
MASTER BALANCE
FRONT
REAR
LEFT
RIGHT
R-C NETWORK
TO RCDR FRONT
TO RCDR REAR
SQ DECODER
PHASE SHIFTER AMPLIFIER/ SUMMING MATRIX
SQ DECODER
P/O MODE LAMP BOARD
SG
-23V
FEEDBACK
BASS
TREBLE
MIDRANGE
TAPE MONITOR
ACCESSORY
MODE/MONITOR SWITCH
MONO
STEREO
4-CH TAPE MONITOR ACCESSORY
FRONT LEFT
FRONT RIGHT
REAR LEFT
REAR RIGHT
TAPE MON IN
ACCESSORY IN
OUT TO RCDR FRONT LEFT
OUT TO RCDR FRONT RIGHT
OUT TO RCDR REAR LEFT
OUT TO RCDR REAR RIGHT
PREAMPLIFIER
FM/AM/AUX
FEEDBACK
RIAA PHONO
SELECTOR
PHONO
FM
AM
AUX 1
AUX 2/CD-4
SELECTOR LAMP BOARD
AUX 2 IN
AUX 1 IN
PHONO IN
FM AUDIO
AM AUDIO

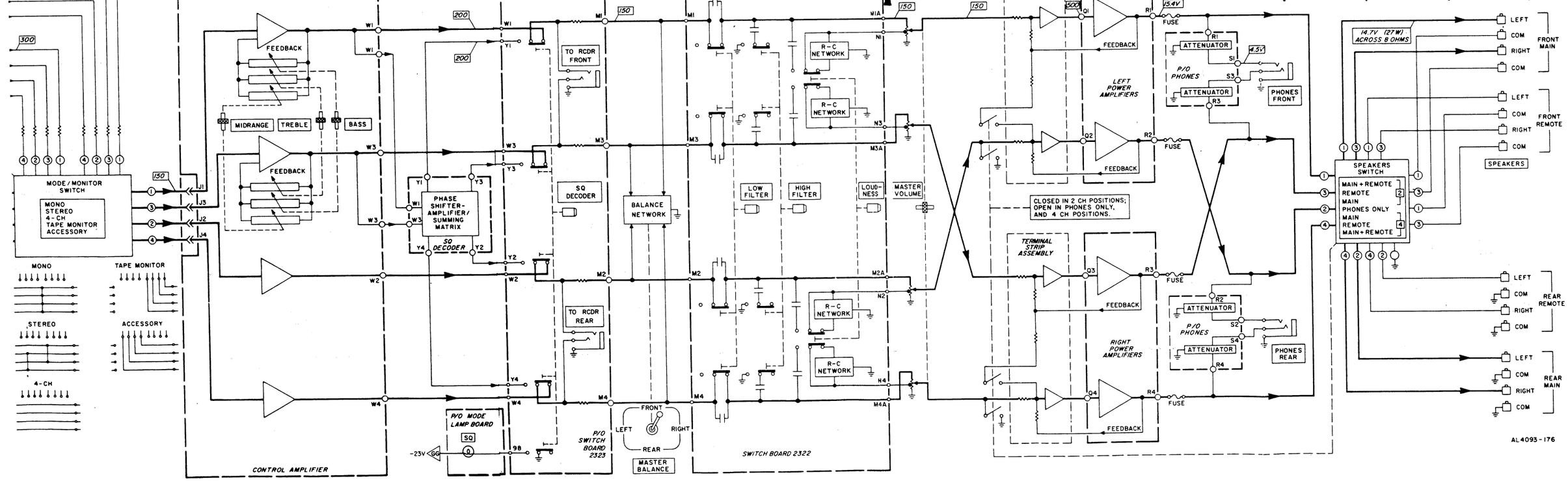
SIGNAL FLOW





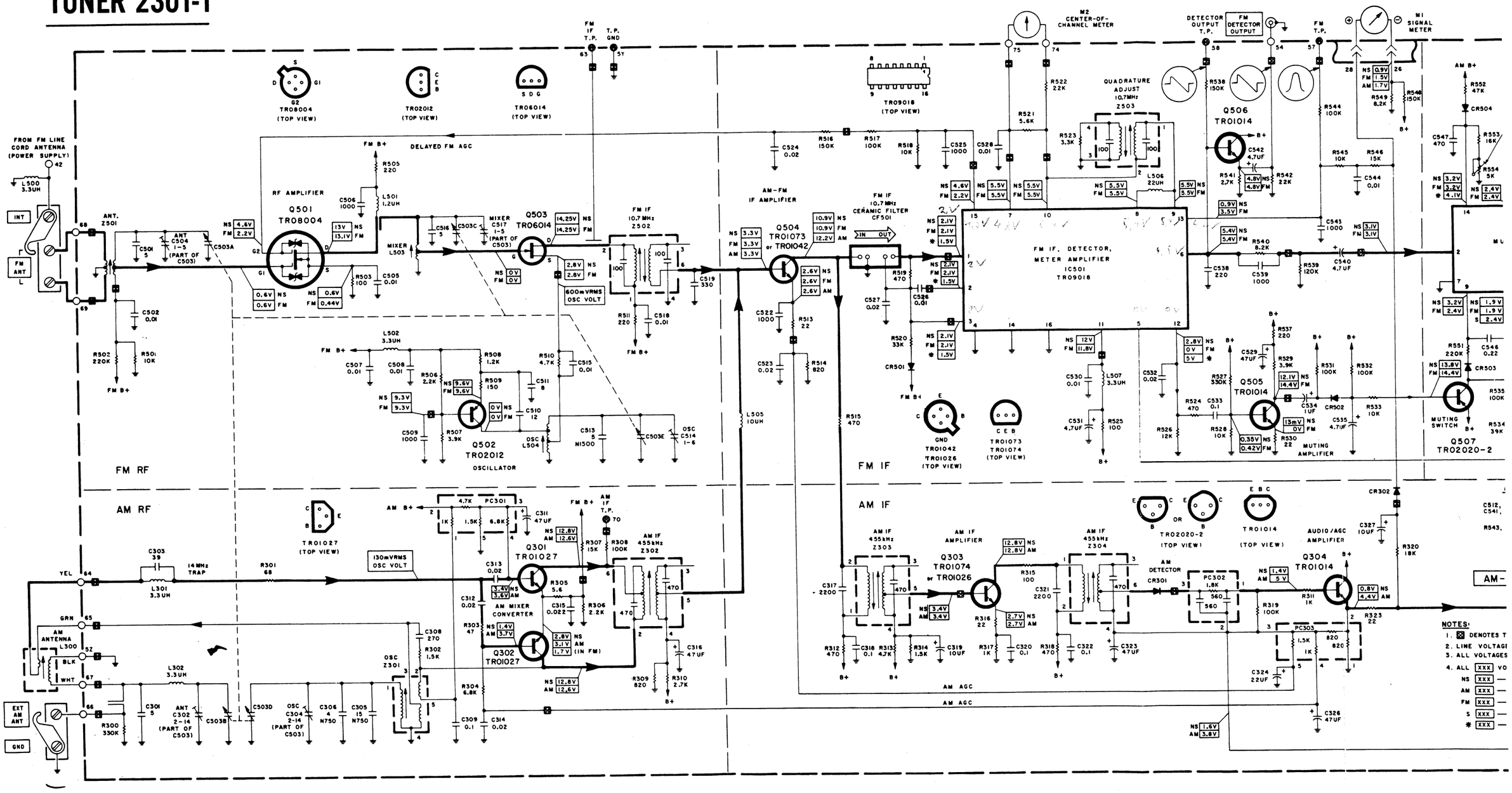
NOTES:
1. LINE VOLTAGE SET TO 120VAC FOR ALL VOLTAGE MEASUREMENTS. EXCEPT AS NOTED; ALL MEASUREMENTS ±20%.
2. XXX DENOTES 1kHz SIGNAL LEVELS (IN MILLIVOLTS) FOR 14.7V OUTPUT ACROSS 8-OHM LOAD, ONE CHANNEL DRIVEN, PUSHBUTTONS OUT, SWITCHES TO 4-CH, VOLUME MAXIMUM. 10mV FM, 1kHz AUDIO ±14kHz DEVIATION AT FM ANT TERMINALS; 100mV AM 1kHz AUDIO 20% MODULATION AT EXT AM ANT TERMINAL, GND LINK OPEN.
3. WHEN SPEAKERS SWITCH IS SET FOR 2-CH OPERATION, FRONT-CHANNEL LOADS MUST FLOAT, TO PREVENT SERIES-CONNECTED REAR AMPLIFIERS FROM BEING SHORT-CIRCUITED.

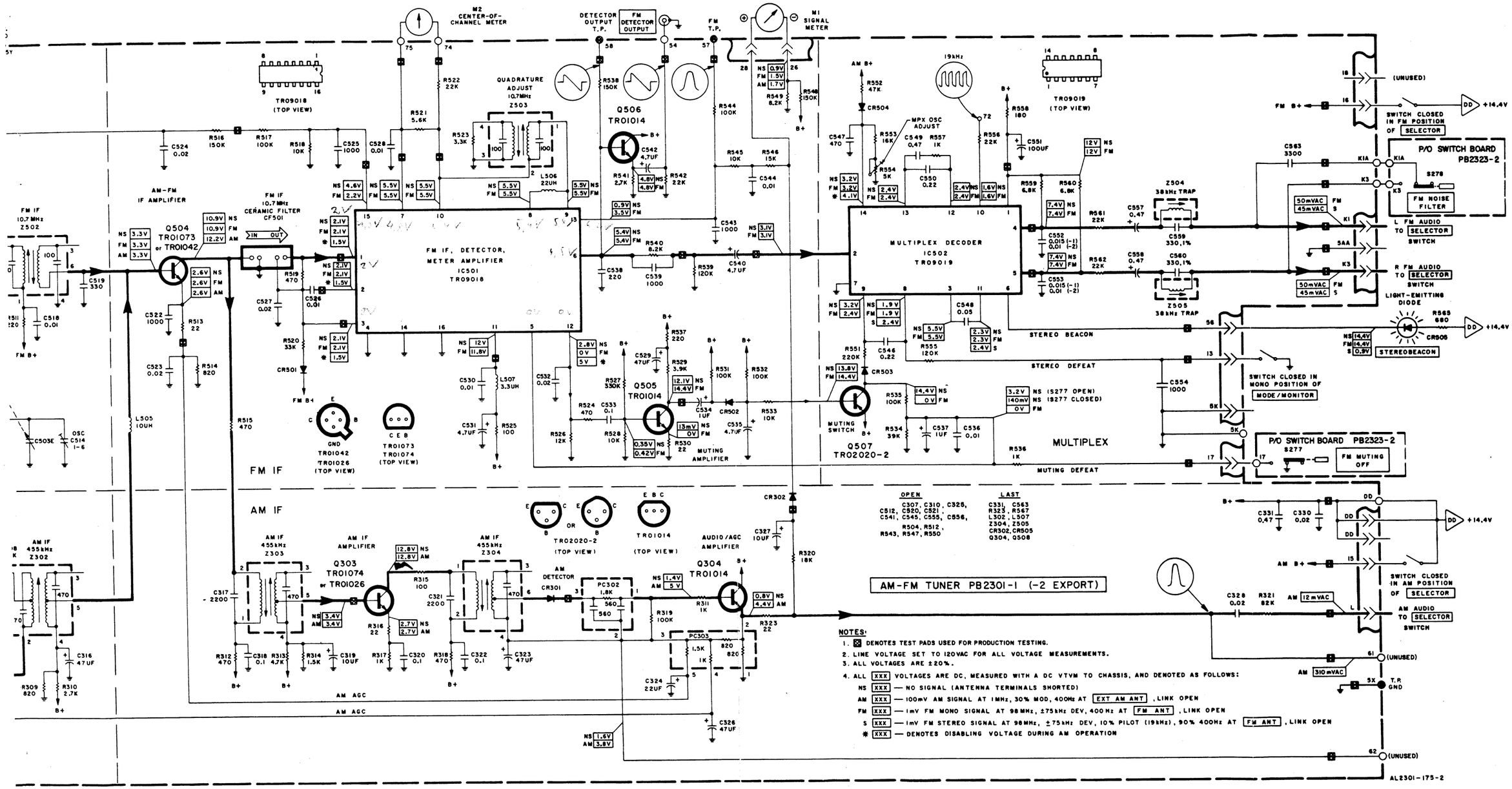




AL 4093-176

TUNER 2301-1


FM RF
AM RF
FM IF
AM IF
FM IF, DETECTOR, METER AMPLIFIER IC501 TR09018
Q501 TR08004
Q502 TR02012 OSCILLATOR
Q503 TR06014
Q504 TR01073 or TR01042
Q505 TR01014
Q506 TR01014
Q507 TR02020-2
Q301 TR01027
Q302 TR01027
Q303 TR01074 or TR01026
Q304 TR01014
DELAYED FM AGC
AM AGC
FROM FM LINE CORD ANTENNA (POWER SUPPLY)
MUTING SWITCH
MUTING AMPLIFIER
AUDIO/AGC AMPLIFIER
AM DETECTOR
QUADRATURE ADJUST 10.7MHz Z503
M1 SIGNAL METER
M2 CENTER-OF-CHANNEL METER
FM DETECTOR OUTPUT
AM ANTENNA L300
FM ANT
EXT AM ANT
GND
14MHz TRAP
130mVRMS OSC VOLT
600mVRMS OSC VOLT
CERAMIC FILTER CF501
AM MIXER CONVERTER
AM IF AMPLIFIER
AM IF 455kHz Z303
AM IF 455kHz Z304
FM IF 10.7MHz Z502
AM IF 455kHz Z302
OSC Z301
ANT Z501
TR08004 (TOP VIEW)
TR02012 (TOP VIEW)
TR06014 (TOP VIEW)
TR09018 (TOP VIEW)
TR01027 (TOP VIEW)
TR01073 TR01074 (TOP VIEW)
GND TR01042 TR01026 (TOP VIEW)
TR02020-2 (TOP VIEW)
TR01014 (TOP VIEW)
NOTES:
1. ⊠ DENOTES T
2. LINE VOLTAGE
3. ALL VOLTAGES
4. ALL XXX VO
NS XXX —
AM XXX —
FM XXX —
S XXX —
* XXX —



OPEN

C307, C310, C326, C512, C520, C521, C541, C545, C555, C556, R504, R512, R543, R547, R550

LAST

C331 C563 R323, R567 L302, L507 Z304, Z505 CR302, CR505 Q304, Q508

NOTES:

1. ⊠ DENOTES TEST PADS USED FOR PRODUCTION TESTING.
2. LINE VOLTAGE SET TO 120VAC FOR ALL VOLTAGE MEASUREMENTS.
3. ALL VOLTAGES ARE ±20%.
4. ALL [XXX] VOLTAGES ARE DC, MEASURED WITH A DC VTVM TO CHASSIS, AND DENOTED AS FOLLOWS:
   - NS [XXX] — NO SIGNAL (ANTENNA TERMINALS SHORTED)
   - AM [XXX] — 100mV AM SIGNAL AT 1MHz, 30% MOD, 400Hz AT [EXT AM ANT], LINK OPEN
   - FM [XXX] — 1mV FM MONO SIGNAL AT 98MHz, ±75kHz DEV, 400Hz AT [FM ANT], LINK OPEN
   - S [XXX] — 1mV FM STEREO SIGNAL AT 98MHz, ±75kHz DEV, 10% PILOT (19kHz), 90% 400Hz AT [FM ANT], LINK OPEN
   - * [XXX] — DENOTES DISABLING VOLTAGE DURING AM OPERATION

AL2301-175-2

TUNER ALIGNMENT

FM ALIGNMENT – AUDIO DISPLAY and FM MUTING OFF depressed, TONE CONTROLS and MASTER BALANCE to center. SPEAKERS to PHONES ONLY, MODE/MONITOR to STEREO, SELECTOR to FM, MASTER VOLUME to MIN.

Maintain generator output as low as possible for suitable indication.

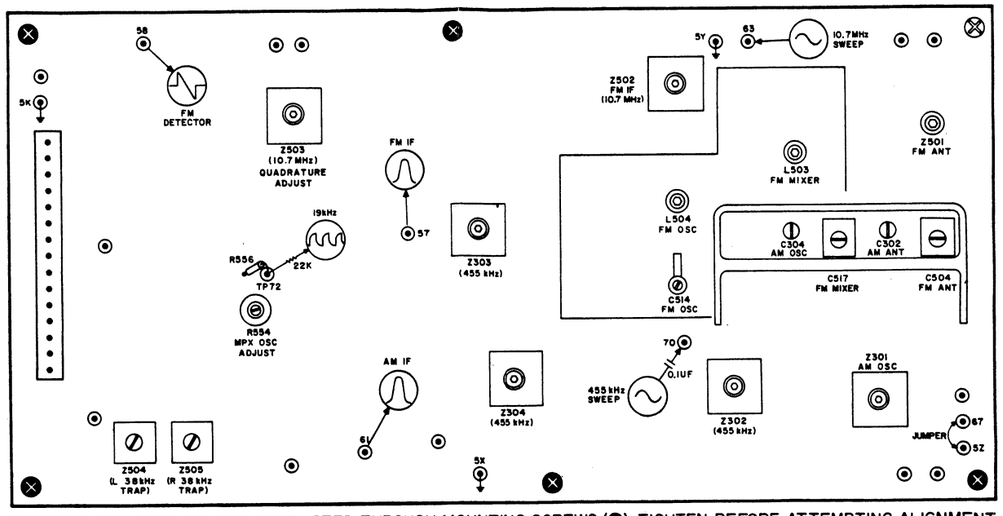
ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
Note: The FM IF circuit utilizes a non-tunable ceramic filter which establishes the IF bandpass. To insure symmetrical tuning and selectivity, the IF must be aligned precisely to the center of the filter bandpass, rather than to 10.7 MHz as in conventional LC circuits.				
1. IF ALIGNMENT	Connect 10.7 MHz sweep to pin 63, gnd to pin 5Y. Markers are not required.	Position of non-interference	Scope vert input to pin 57, gnd to pin 5K.	Adjust Z502 top and bottom slugs for max gain and best symmetry. Keep signal low enough for noise on response as shown in FM IF.
2. PRELIMINARY DETECTOR ALIGNMENT	10.7 MHz sweep to pin 63, gnd to pin 5Y. Adjust for S-curve display.	Position of non-interference	Scope vert input to pin 58, gnd to pin 5K, front panel center-of-channel meter M2.	Adjust Z503 top slug for max gain, best linearity, and zero deflection of M2. Adjust bottom slug for minimum gain and best linearity. See FM DETECTOR response. Note: Minimum THD test must be performed as part of detector alignment.
Note: 120-ohm composition resistors in series with each lead from the RF generator match the 50-ohm output to the 300-ohm input impedance. Generator output voltage is reduced to one-half at antenna terminals. Signal voltages specified in this table are generator output levels, not antenna voltages.				
3. FRONT END ALIGNMENT		Tuning knob fully CCW.		Center dial pointer on 0 and cement.
4.	FM generator to FM ANTenna terminals through 120-ohm resistors. Set to 90 MHz. Adjust output for approx 2 on M1.	Center of 90 MHz calibration mark on dial.	Front panel signal meter M1, center-of-channel meter M2.	Adjust L504, L503, Z501 for max deflection of M1, zero deflection of M2. Reduce generator output to keep M1 indication at approx 2.
5.	Set to 106 MHz	Center of 106 MHz calibration mark on dial.	Front panel signal meter M1, center-of-channel meter M2.	Adjust C514, C517, C504 for max deflection of M1, zero deflection of M2. Reduce generator output to keep M1 indication at approx 2. Repeat steps 4 and 5 for max signal and accurate dial calibration.
6. FINAL DETECTOR ALIGNMENT (MINIMUM THD)	Set to position of non-interference. Modulate with 400 Hz, ±75 kHz deviation.	Tune to generator.	Scope vert input to OUT TO RCDR FRONT LEFT jack.	Reduce generator output for noise visible on sine wave. Readjust generator frequency to center noise on positive and negative half cycles. See SYMMETRICAL TUNING response. Note: Do not change generator or receiver tuning; proceed with minimum THD adjustment.
7.	Increase generator output to 2 mV.		Front panel center-of-channel meter M2, AC VTVM and HD analyzer to OUT TO RCDR FRONT LEFT jack.	Adjust Z503 top slug for zero deflection of M2. Adjust bottom slug for minimum THD (0.2% typical). Readjust top slug for zero deflection of M2.
8. MUTING TEST	Reduce generator output to 4 uV. Modulate with 400 Hz, ±25 kHz deviation.	Tune to generator.	AC VTVM and scope vert input to OUT TO RCDR FRONT LEFT jack.	Release FM MUTING OFF pushbutton. Audio should disappear. Increase generator output to 16 uV. Audio should reappear on scope. (No adjustment.)
9. MPX OSC ADJUSTMENT	Set to position of non-interference, with CW output of 2 mV.	Tune to generator. Release FM MUTING OFF pushbutton.	Connect frequency counter to TP 72.	Adjust R554 for indication of 19,000 Hz (±50 Hz).
ALTERNATE MPX OSC ADJUSTMENT	Set to position of non-interference, with CW output of 2 mV.	Tune to generator. Release FM MUTING OFF pushbutton.	Scope vert input to TP 72 through 22K. Scope hor input to MPX generator 19,000 Hz pilot output.	Adjust R554 for stable Lissajou display as shown in MPX OSC response.
10. 38 kHz TRAP ADJUSTMENT			Scope vert input to audio oscillator output. Scope hor input to MPX generator 19,000 Hz pilot output.	Adjust osc frequency for stable 2:1 Lissajou display (38,000 Hz). Note: Do not change osc frequency; proceed with 38 kHz trap adjustment.
11.	Modulate generator with 38,000 Hz, ±75 kHz deviation. Set generator output to 2 mV.	Tune to generator.	AC VTVM and scope vert input to OUT TO RCDR FRONT LEFT jack, another AC VTVM and scope to FRONT RIGHT jack.	Adjust Z504 and Z505 for minimum (typically more than 40 dB below audio level).

AM ALIGNMENT – AUDIO DISPLAY and AM DNL depressed, TONE CONTROLS and MASTER BALANCE to center. SPEAKERS to PHONES ONLY, MODE/MONITOR to STEREO, SELECTOR to AM, MASTER VOLUME to MIN.

Maintain generator output as low as possible for suitable indication.

ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
1. IF ALIGNMENT	455 kHz sweep generator to pin 70, gnd to pin 5X. Use 0.1 uF capacitor in series with generator lead.	Position of non-interference near 1400 kHz.	Scope vert input to pin 61, gnd to pin 5X.	Connect a jumper between pin 67 and pin 5Z. Adjust Z304, Z303, Z302 top and bottom slugs for max gain and best symmetry. Keep signal low enough for noise on response as shown in AM IF. Disconnect jumper.
2. FRONT END ALIGNMENT	AM generator to EXT AM ANT and GND terminals. Open GND link. Set to 600 kHz. Modulate with 400 Hz, 30% modulation.	Center of 600 kHz calibration mark on dial.	Front panel signal meter, M1.	Adjust Z301 and L300 (antenna) for max deflection. Reduce generator output to keep panel meter at approx 3.
3.	Set to 1400 kHz.	Center of 1400 kHz calibration mark on dial.	Front panel signal meter, M1.	Adjust C304 and C302 for max deflection. Keep meter at approx 3. Repeat steps 2 and 3 for max signal and accurate dial calibration.

ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
9. MPX OSC ADJUSTMENT	Set to position of non-interference, with CW output of 2 mV.	Tune to generator. Release FM MUTING OFF pushbutton.	Connect frequency counter to TP 72.	Adjust R554 for indication of 19,000 Hz (±50 Hz).
ALTERNATE MPX OSC ADJUSTMENT	Set to position of non-interference, with CW output of 2 mV.	Tune to generator. Release FM MUTING OFF pushbutton.	Scope vert input to TP 72 through 22K. Scope hor input to MPX generator 19,000 Hz pilot output.	Adjust R554 for stable Lissajou display as shown in MPX OSC response.
10. 38 kHz TRAP ADJUSTMENT			Scope vert input to audio oscillator output. Scope hor input to MPX generator 19,000 Hz pilot output.	Adjust osc frequency for stable 2:1 Lissajou display (38,000 Hz). Note: Do not change osc frequency; proceed with 38 kHz trap adjustment.
11.	Modulate generator with 38,000 Hz, ±75 kHz deviation. Set generator output to 2 mV.	Tune to generator.	AC VTVM and scope vert input to OUT TO RCDR FRONT LEFT jack, another AC VTVM and scope to FRONT RIGHT jack.	Adjust Z504 and Z505 for minimum (typically more than 40 dB below audio level).

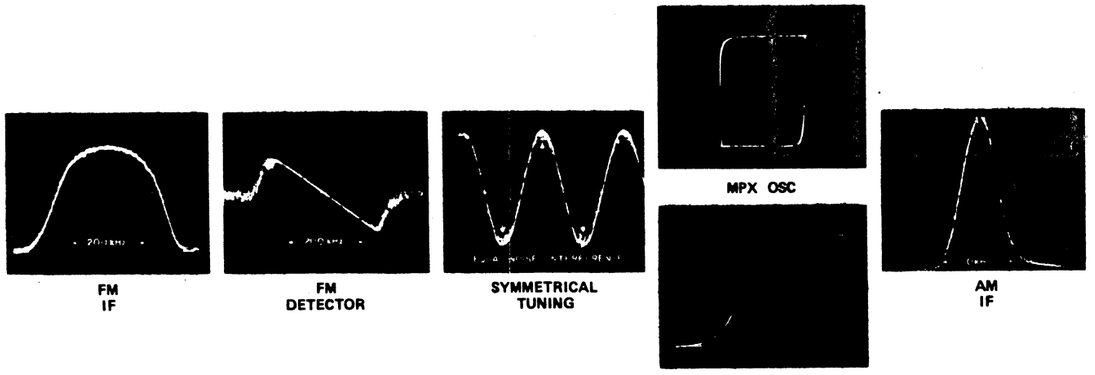


NOTE: CHASSIS GROUNDS ARE COMPLETED THROUGH MOUNTING SCREWS (⊗). TIGHTEN BEFORE ATTEMPTING ALIGNMENT.

AM ALIGNMENT – AUDIO DISPLAY and AM DNL depressed, TONE CONTROLS and MASTER BALANCE to center. SPEAKERS to PHONES ONLY, MODE/MONITOR to STEREO, SELECTOR to AM, MASTER VOLUME to MIN.

Maintain generator output as low as possible for suitable indication.

ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
1. IF ALIGNMENT	455 kHz sweep generator to pin 70, gnd to pin 5X. Use 0.1 uF capacitor in series with generator lead.	Position of non-interference near 1400 kHz.	Scope vert input to pin 61, gnd to pin 5X.	Connect a jumper between pin 67 and pin 5Z. Adjust Z304, Z303, Z302 top and bottom slugs for max gain and best symmetry. Keep signal low enough for noise on response as shown in AM IF. Disconnect jumper.
2. FRONT END ALIGNMENT	AM generator to EXT AM ANT and GND terminals. Open GND link. Set to 600 kHz. Modulate with 400 Hz, 30% modulation.	Center of 600 kHz calibration mark on dial.	Front panel signal meter, M1.	Adjust Z301 and L300 (antenna) for max deflection. Reduce generator output to keep panel meter at approx 3.
3.	Set to 1400 kHz.	Center of 1400 kHz calibration mark on dial.	Front panel signal meter, M1.	Adjust C304 and C302 for max deflection. Keep meter at approx 3. Repeat steps 2 and 3 for max signal and accurate dial calibration.



FM IF

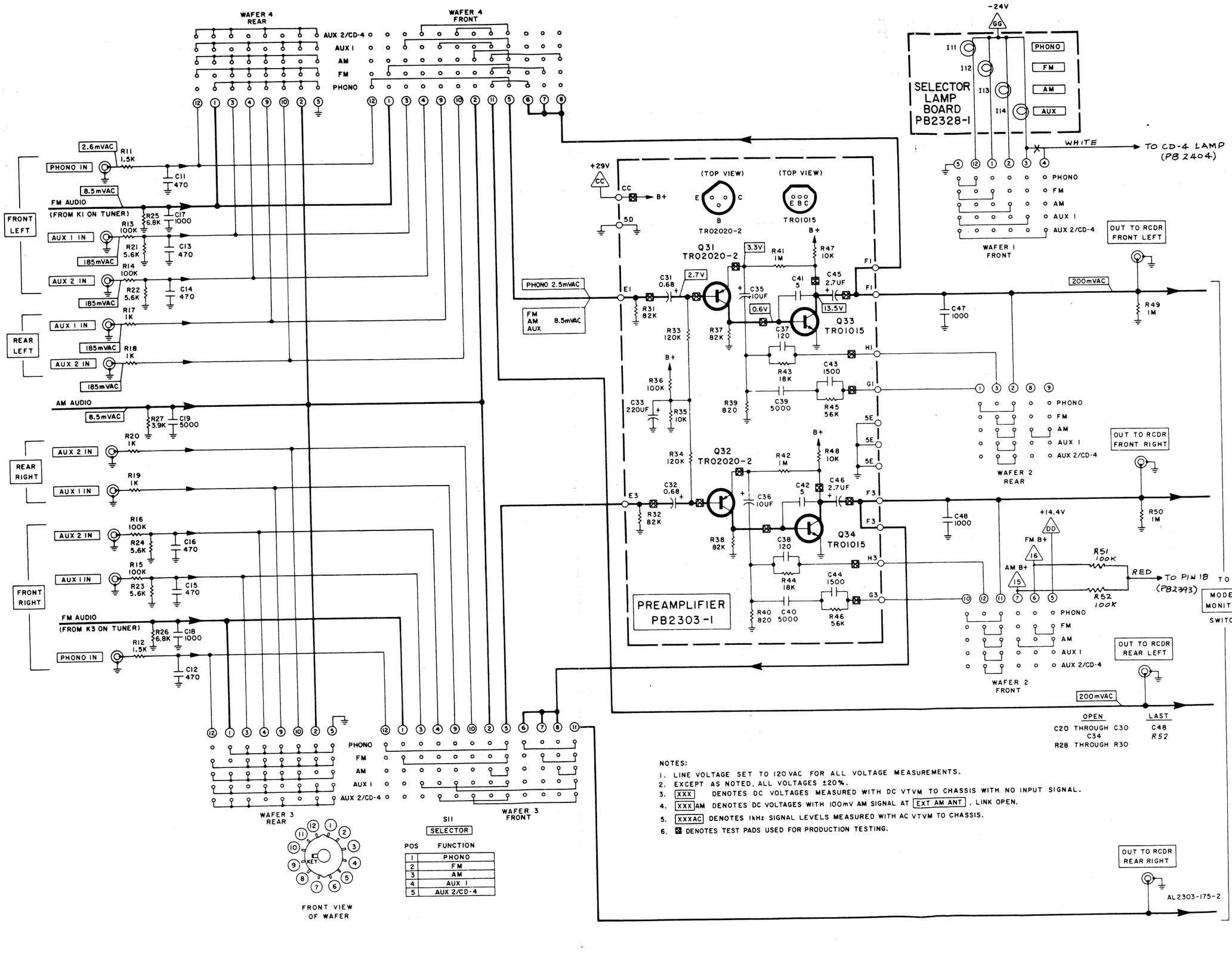
FM DETECTOR

SYMMETRICAL TUNING

MPX OSC

AM IF

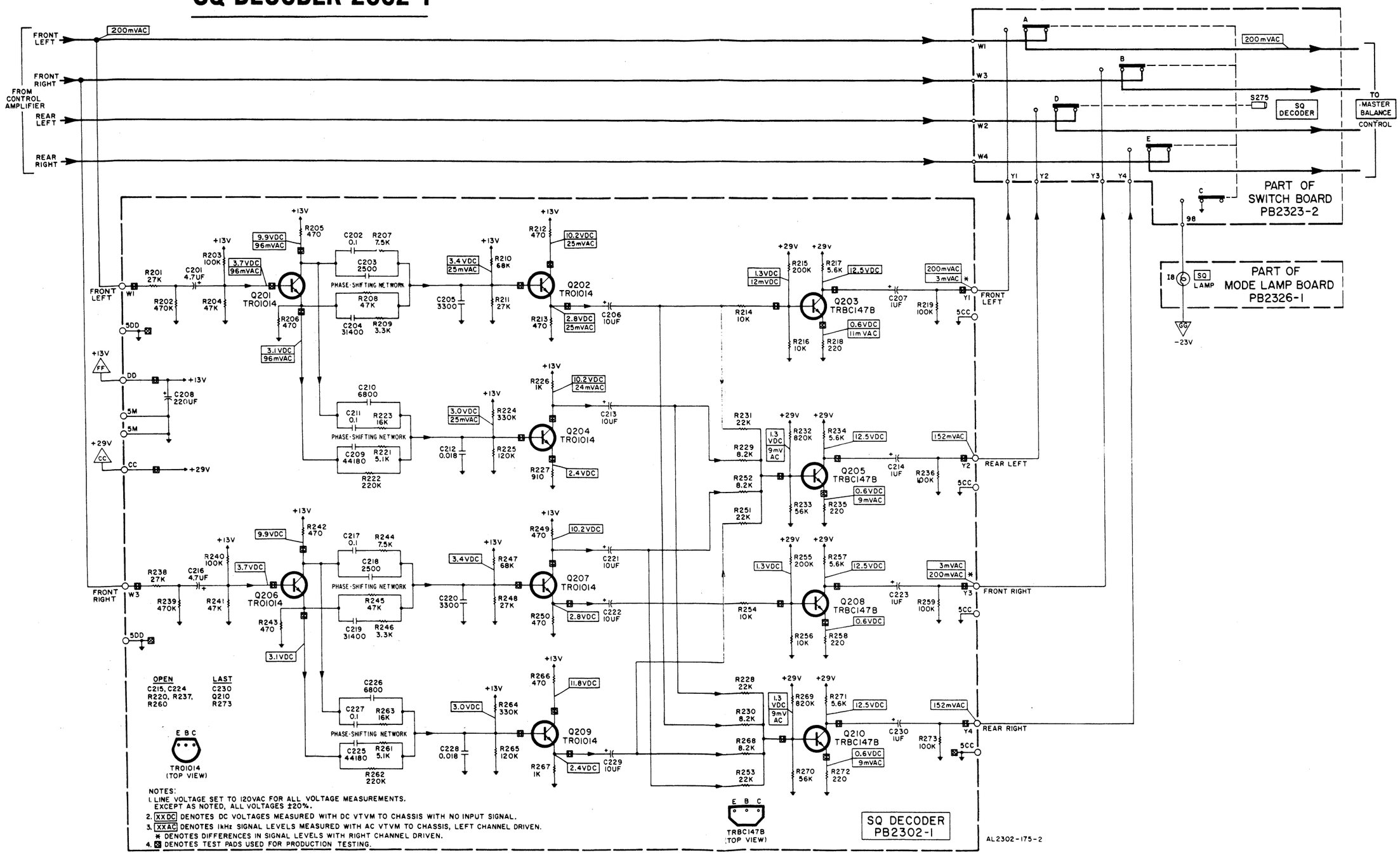
PREAMPLIFIER 2303-1



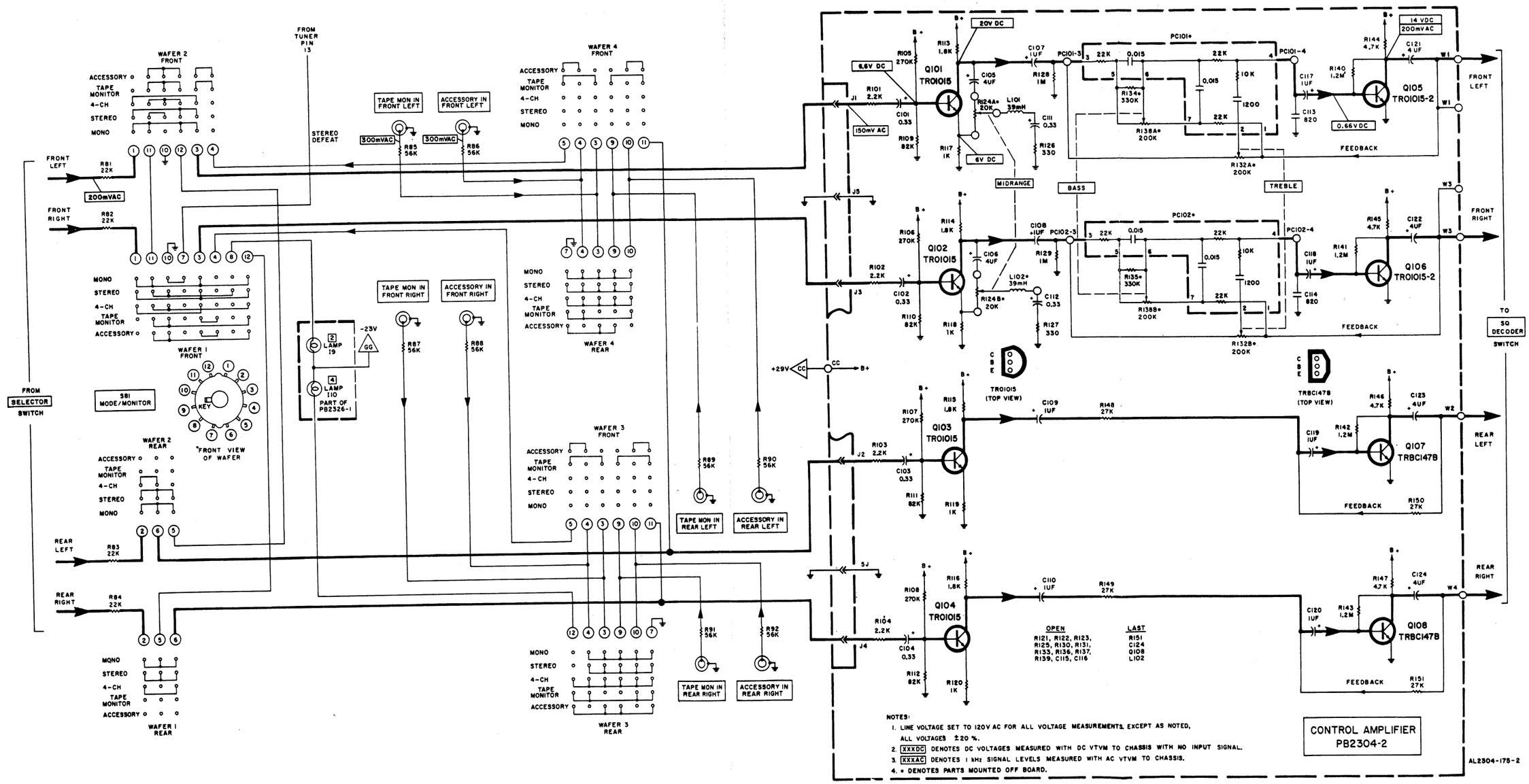
NOTES:

1. LINE VOLTAGE SET TO 120 VAC FOR ALL VOLTAGE MEASUREMENTS.
2. EXCEPT AS NOTED, ALL VOLTAGES ±20%.
3. [XXX] DENOTES DC VOLTAGES MEASURED WITH DC VTVM TO CHASSIS WITH NO INPUT SIGNAL.
4. [XXX]AM DENOTES DC VOLTAGES WITH 100mV AM SIGNAL AT [EXT AM ANT], LINK OPEN.
5. [XXXAC] DENOTES 1kHz SIGNAL LEVELS MEASURED WITH AC VTVM TO CHASSIS.
6. ⊠ DENOTES TEST PADS USED FOR PRODUCTION TESTING.

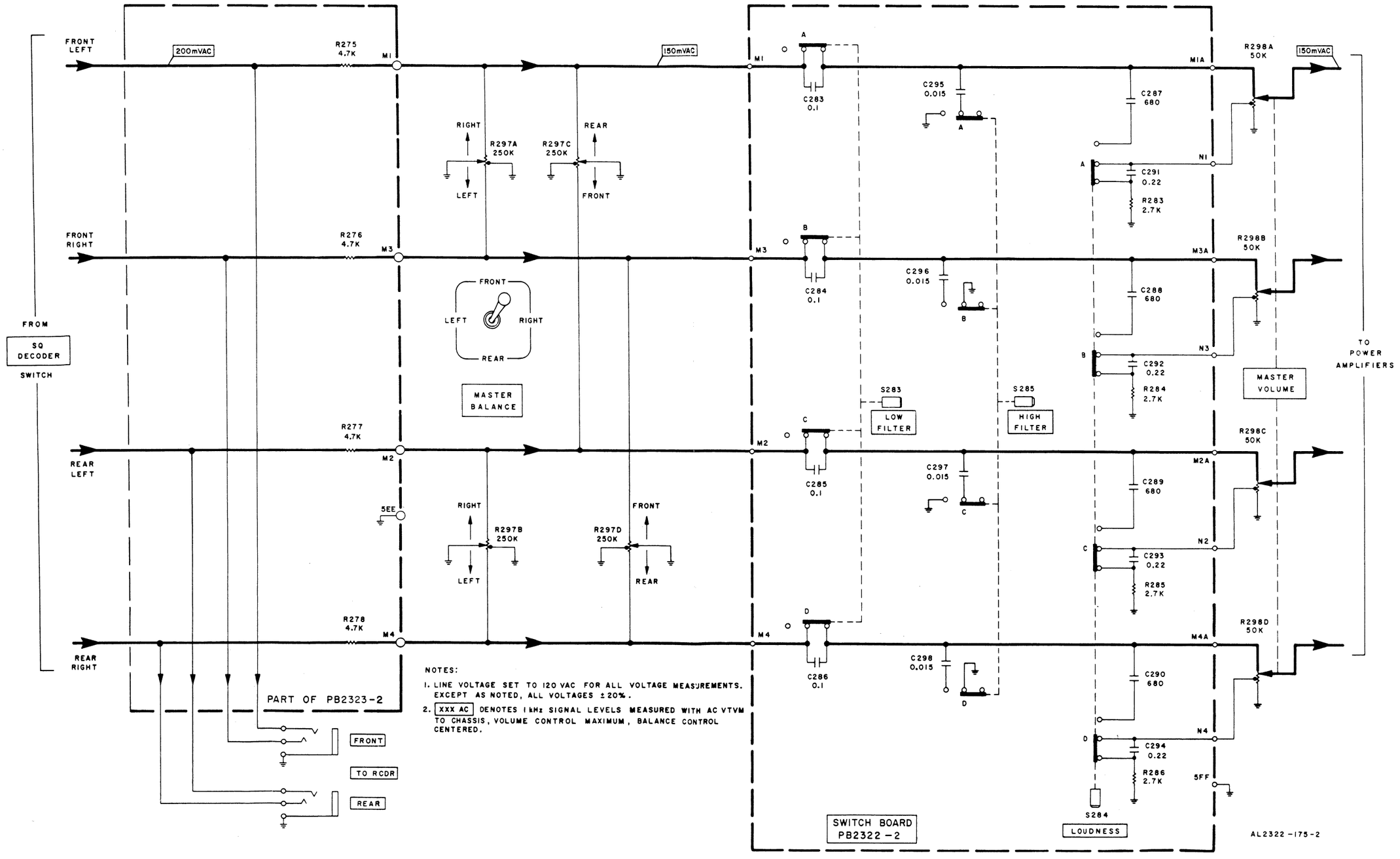
SQ DECODER 2302-1



CONTROL AMPLIFIER 2304-2



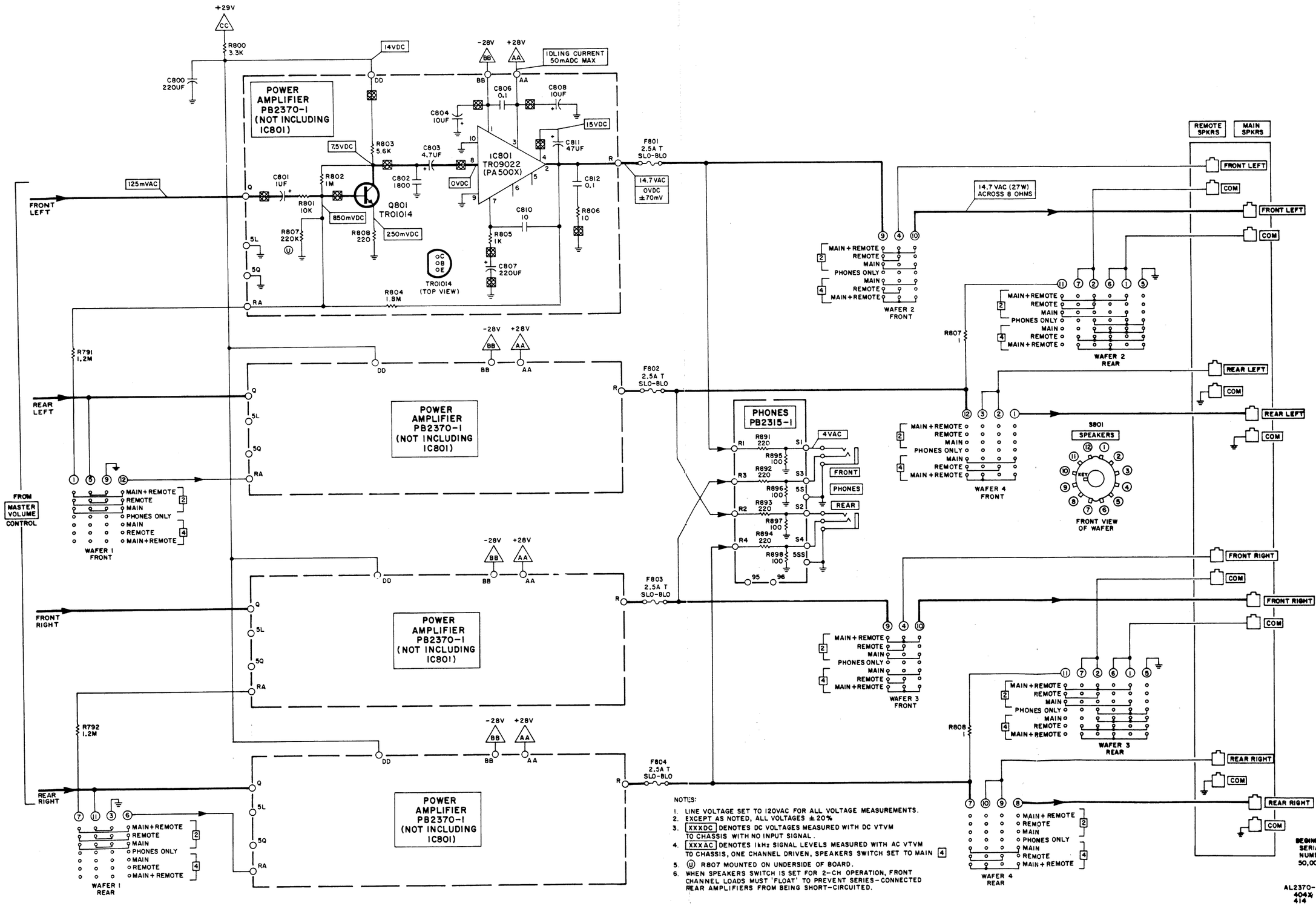
SWITCH BOARDS 2322-1/2323-1



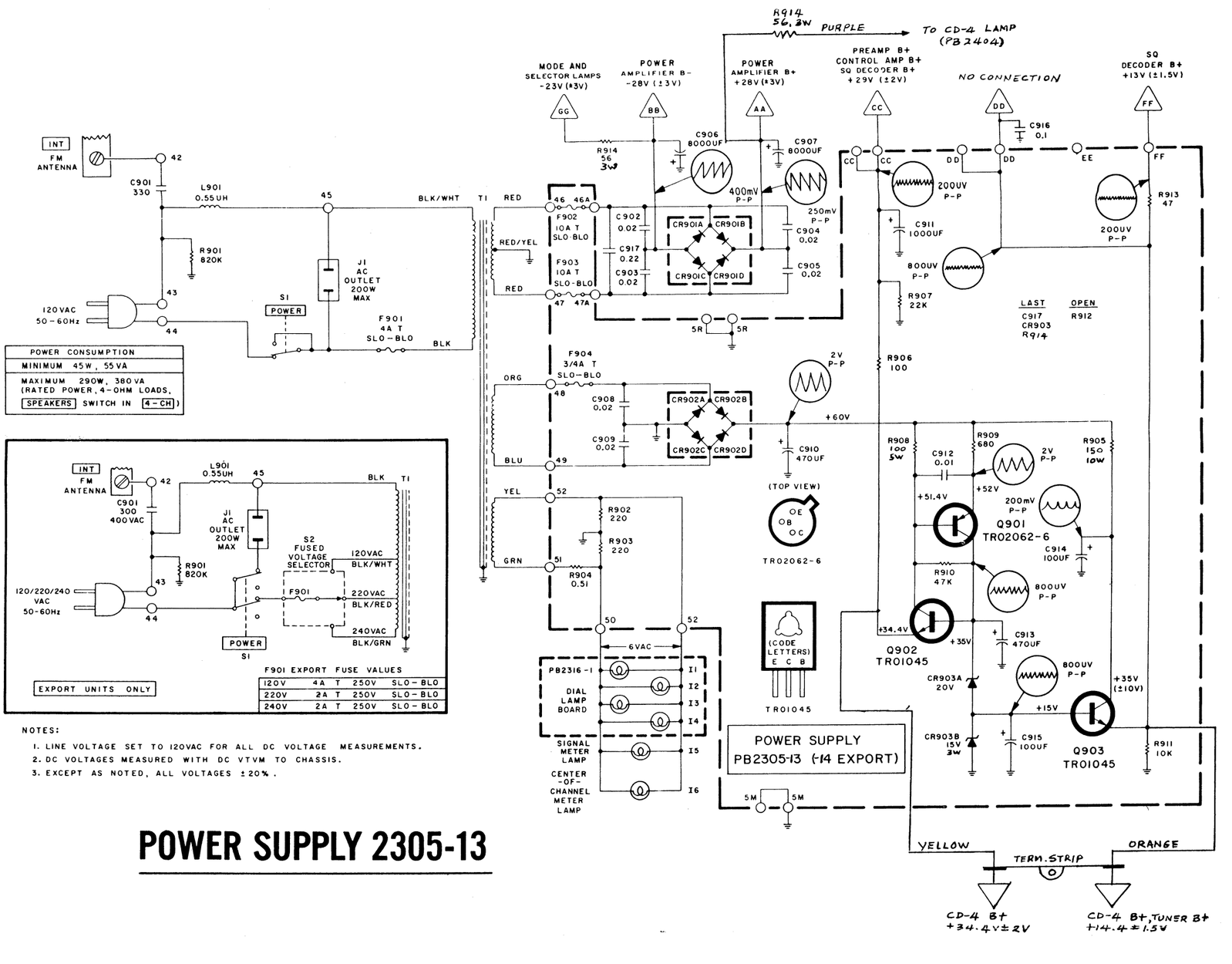
NOTES:

1. LINE VOLTAGE SET TO 120 VAC FOR ALL VOLTAGE MEASUREMENTS. EXCEPT AS NOTED, ALL VOLTAGES ±20%.
2. [XXX AC] DENOTES 1 kHz SIGNAL LEVELS MEASURED WITH AC VTVM TO CHASSIS, VOLUME CONTROL MAXIMUM, BALANCE CONTROL CENTERED.

POWER AMPLIFIER



POWER SUPPLY 2305-13



NOTES:

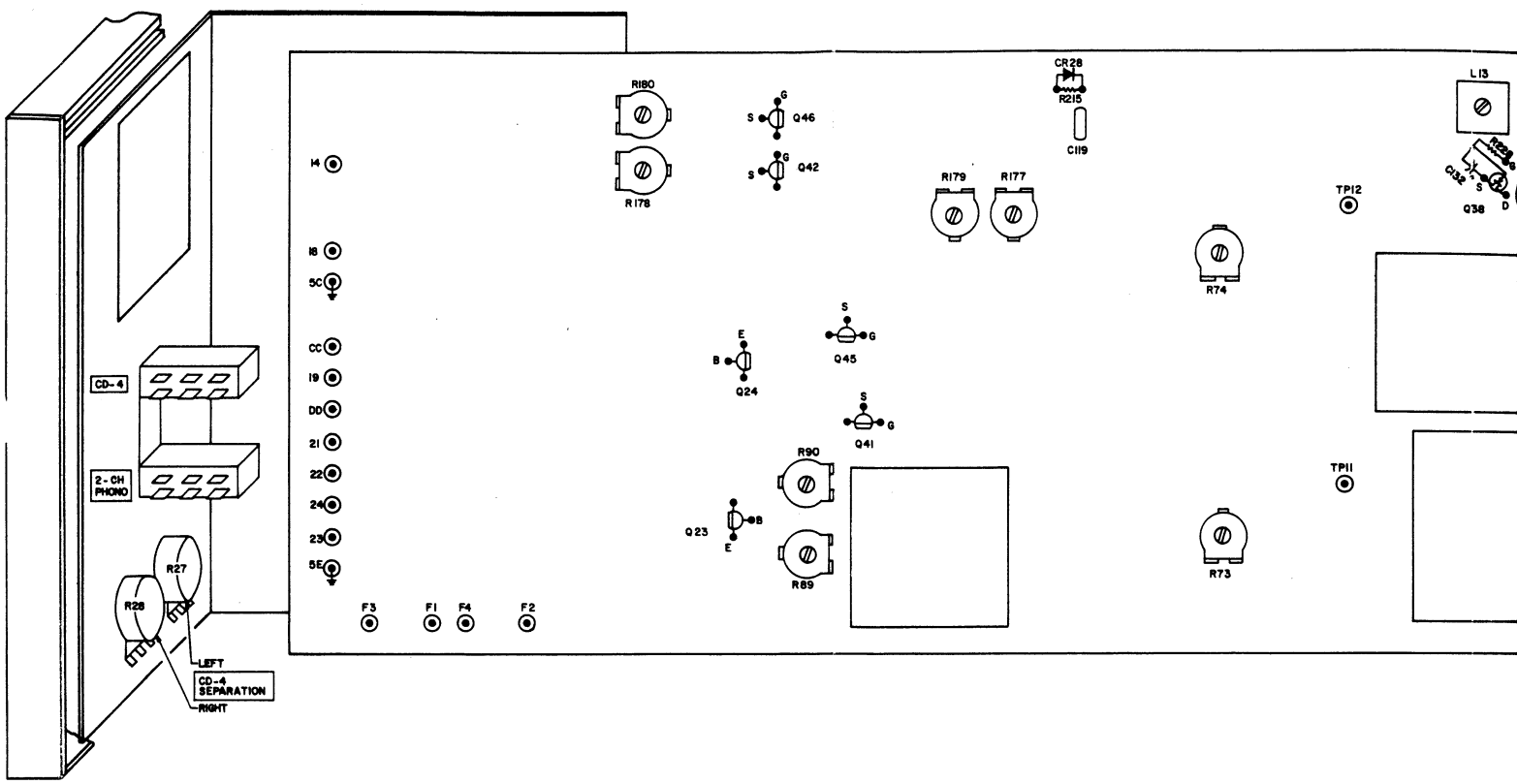
1. LINE VOLTAGE SET TO 120VAC FOR ALL DC VOLTAGE MEASUREMENTS.
2. DC VOLTAGES MEASURED WITH DC VTVM TO CHASSIS.
3. EXCEPT AS NOTED, ALL VOLTAGES ±20%.

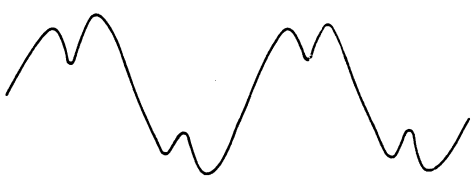
CD-4 ALIGNMENT

RECEIVER SWITCHES AND CONTROLS SETTING: MODE/MONITOR to TAPE MONITOR, MASTER VOLUME to MIN, SELECTOR to CD-4, CD-4 PUSHBUTTON SWITCH DEPRESSED

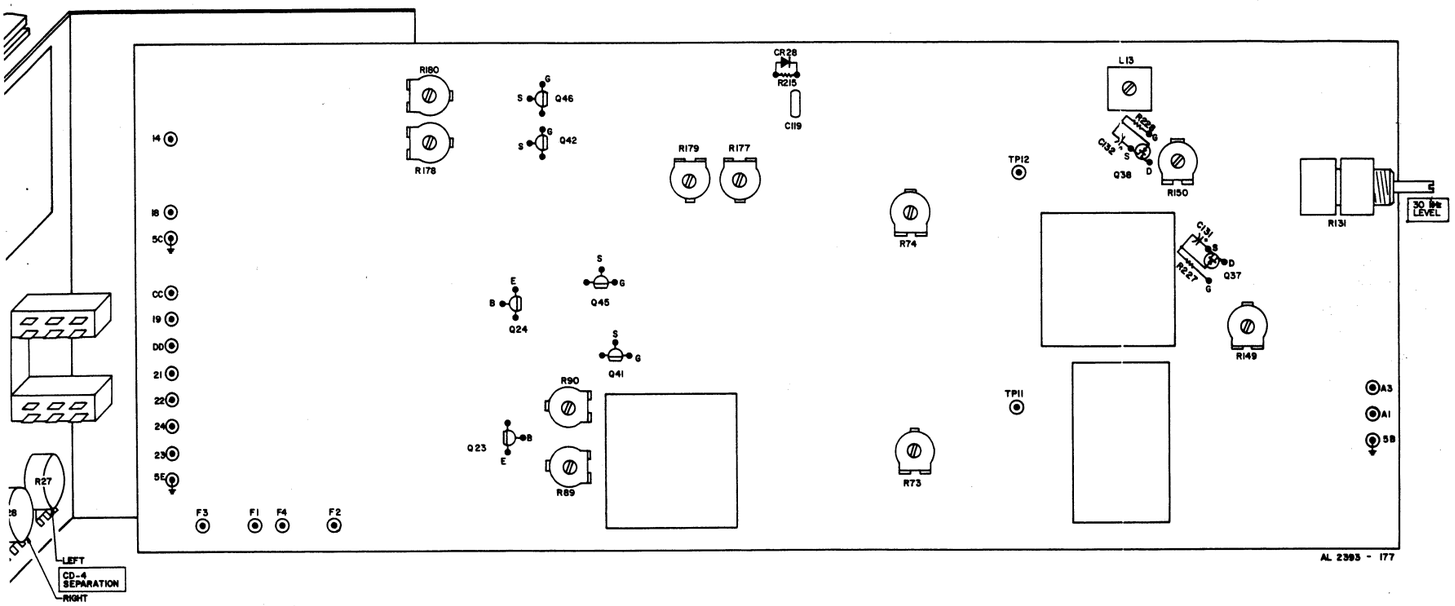
ITEM	GENERATOR	INDICATOR	PROCEDURE
1. PRELIMINARY ANRS ALIGNMENT		DC VTVM to sources of Q41, Q45, Q42 and Q46 in turn.	Adjust R177, R179, R178 and R180, respectively, for 2.5V± 0.2V.
2. FINAL ANRS ALIGNMENT (LEFT CHANNEL).	Audio oscillator to base of Q23 through 10UF electrolytic capacitor (+ side facing circuit). Set oscillator output to 220 mV and frequency to 30 Hz.	AC VTVM and scope vertical input to OUT TO RCDR FRONT LEFT jack on receiver rear panel.	Defeat muting circuit by connecting pin 14 to chassis ground. Short CD-4 IN LEFT and RIGHT jacks. Set LEFT CD-4 SEPARATION control to maximum counterclockwise position. VTVM should indicate 250mV± 50mV. Record this reading as 0 dB.
3.	Decrease audio oscillator output to 2.2 mV.	AC VTVM	VTVM should indicate -40 dB± 1 dB.
4.	Increase audio oscillator frequency to 600 Hz.	AC VTVM	VTVM should indicate -52dB ± 3dB. Slowly adjust R177 until VTVM indication increases approximately 0.3 dB.
5.	Increase audio oscillator frequency to 10 kHz.	AC VTVM	VTVM should indicate -54 dB± 3 dB. Slowly adjust R179 counterclockwise until VTVM indication increases approximately 0.3 dB.
6. FINAL ANRS ALIGNMENT (RIGHT CHANNEL).	Audio oscillator to base of Q24. Set output to 220 mV and frequency to 30 Hz.	AC VTVM and scope vertical input to OUT TO RCDR FRONT RIGHT jack on receiver rear panel.	Maintain ground to pin 14 and short to CD-4 IN LEFT and RIGHT jacks. Set RIGHT CD-4 SEPARATION control to maximum counterclockwise position. VTVM should indicate 250 mV± 50 mV. Record this reading as 0 dB.
7.	Decrease audio oscillator output to 2.2 mV.	AC VTVM	VTVM should indicate -40 dB± 1 dB.
8.	Increase audio oscillator frequency to 600 Hz.	AC VTVM	VTVM should indicate -52 dB± 3 dB. Slowly adjust R178 counterclockwise until VTVM indication increases approximately 0.3 dB.
9.	Increase audio oscillator frequency to 10 kHz.	AC VTVM	VTVM should indicate -54 dB± 3 dB. Slowly adjust R180 counterclockwise until VTVM indication increases approximately 0.3 dB.
10. MUTING ALIGNMENT.	Setup CD-4 generator as follows: Sub-channel carrier level - 180 uV. Channel Selector - FRONT Deviation - 1 kHz Base Channel - OFF Input Freq. - 1 kHz	DC VTVM to junction of R215 and C119.	Connect CD-4 generator to CD-4 IN RIGHT input. Set 30 KHZ LEVEL control to its maximum clockwise position. VTVM should indicate 1.6± 0.4V. CD-MATIC lamp should light. If correct indications are not obtained, adjust slug at top of L13 until indications are correct.
11. VCO FREQUENCY AND HOLD RANGE ALIGNMENT (LEFT CHANNEL)	Setup CD-4 generator as follows: Sub-channel carrier level - 1 mV Channel Selector - FRONT Deviation - 6 kHz Base Channel - OFF Input Freq. - 1 kHz	DC VTVM to gate of Q37; AC VTVM and scope to OUT TO RCDR FRONT LEFT jack on receiver rear panel.	Set R149 to its extreme counterclockwise position. DC VTVM should indicate -6.5± 1V. Adjust R89 to its mechanical center position. Connect CD-4 generator output to both the CD-4 IN RIGHT and CD-4 IN LEFT inputs.
12.	Increase CD-4 generator deviation output to 8 kHz.	Scope	Adjust R73 until scope display is distorted symmetrically. See VCO WAVEFORM. Reduce deviation on CD-4 generator until scope display is no longer distorted At this point deviation should be 7.5kHz± 2 kHz.
13.	Decrease CD-4 generator Sub channel carrier level to 500 uV and deviation to 4 kHz.	Scope	Slowly adjust R149 until scope display is distorted. Slightly readjust R149 until scope display is no longer distorted. Reduce CD-4 generator Sub-channel carrier level to 450 uV. Scope display should again be distorted.
14. VCO FREQUENCY AND HOLD RANGE ALIGNMENT (RIGHT CHANNEL).	Setup CD-4 generator as indicated in step 11.	DC VTVM to gate of Q38; AC VTVM and scope to OUT TO RCDR FRONT RIGHT jack on receiver rear panel.	Set R150 to its extreme counterclockwise position. DC VTVM should indicate -6.5V ± 1V. Adjust R90 to its mechanical center position.
15.	Increase CD-4 generator deviation output to 8 kHz.	Scope	Adjust R74 until scope display is distorted symmetrically. See VCO WAVEFORM. Reduce deviation on CD-4 generator until scope display is no longer distorted. At this point deviation should be 7.5kHz± 2 kHz.

ITEM	GENERATOR	INDICATOR	PROCEDURE
16.	Decrease CD-4 generator Sub-channel carrier level to 500 uV and deviation to 4 kHz.	Scope	Slowly adjust R150 until scope display is distorted. Slightly readjust R150 until scope display is no longer distorted. Reduce CD-4 generator Sub-channel carrier level to 450 uV. Scope display should again be distorted.
17. FM-PM-FM EQUALIZER ALIGNMENT (LEFT CHANNEL)	Setup CD-4 generator outputs as follows: Sub-channel carrier level - 1.5 mV Channel Selector - FRONT Deviation - 2.2 kHz Base Channel - OFF Input Freq. - 1 kHz.	AC VTVM and scope to emitter of Q23.	AC VTVM should indicate 200 mV± 10 mV. If indication is not correct, adjust R89 until correct indication is obtained.
18. FM-PM-FM EQUALIZER ALIGNMENT (RIGHT CHANNEL)	Maintain same setup of CD-4 generator as indicated in previous step.	AC VTVM and scope to emitter of Q24.	AC VTVM should indicate 200 mV± 10 mV. If indication is not correct, adjust R90 until correct indication is obtained.
19. LEFT CHANNEL SEPARATION TEST AND ALIGNMENT.	Setup CD-4 generator outputs as follows: Sub-channel carrier level - 1.5 mV. Channel Selector-REAR Deviation - 2.2 kHz Base Channel carrier level - 2.8 mV Delay - 40 usec Input Freq. - 1 kHz	AC VTVM to OUT TO RCDR FRONT LEFT jack on receiver rear panel.	Adjust LEFT CD-4 SEPARATION control for lowest reading on VTVM.
20.	Set CD-4 generator Channel Selector to FRONT	AC VTVM	VTVM should indicate 500 mV± 120 mV . Record this reading as 0 dB.
21.	Set CD-4 generator Channel Selector to REAR.	AC VTVM	VTVM should indicate at least 20 dB below 0 dB reference of preceding step.
22.		AC VTVM to OUT TO RCDR REAR LEFT jack on receiver rear panel.	VTVM should indicate 450 mV ± 100 mV. Record this reading as 0 dB.
23.	Set CD-4 generator Channel Selector to FRONT	AC VTVM	VTVM should indicate at least 20 dB below 0 dB reference of preceding step.





VCO WAVEFORM



REPLACING CD-MATIC OR CD-4 LAMP

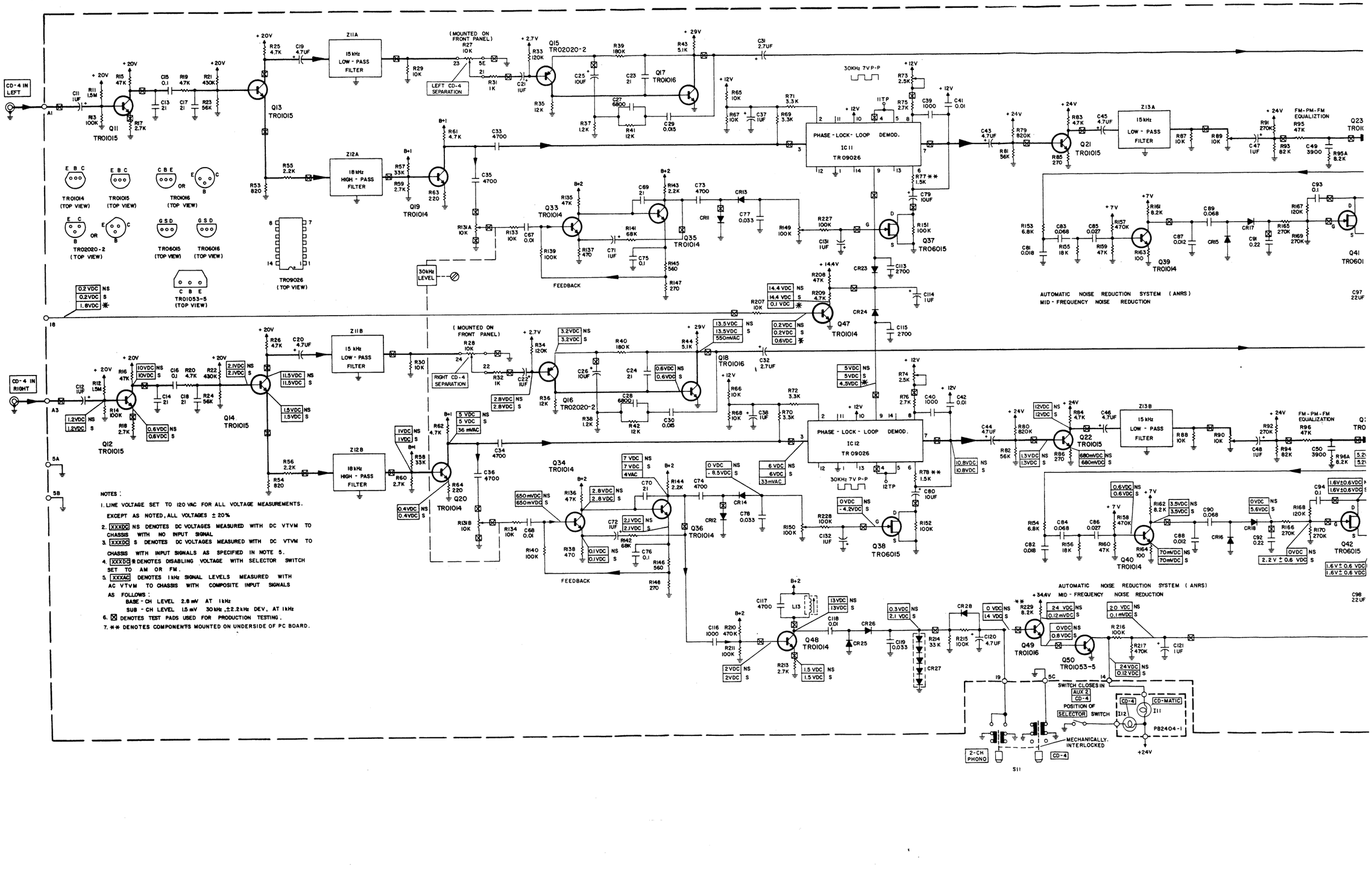
(1) Unplug AC power cord and remove cabinet.

(2) Remove lamp PCB by removing two screws securing it to the front panel of the Demodulator.

(3) Gently pull back the lamp PCB until the lamps clear the holes in the plastic lamp housings.

(4) Unsolder and remove defective lamp and solder replacer t lamp on lamp PCB.

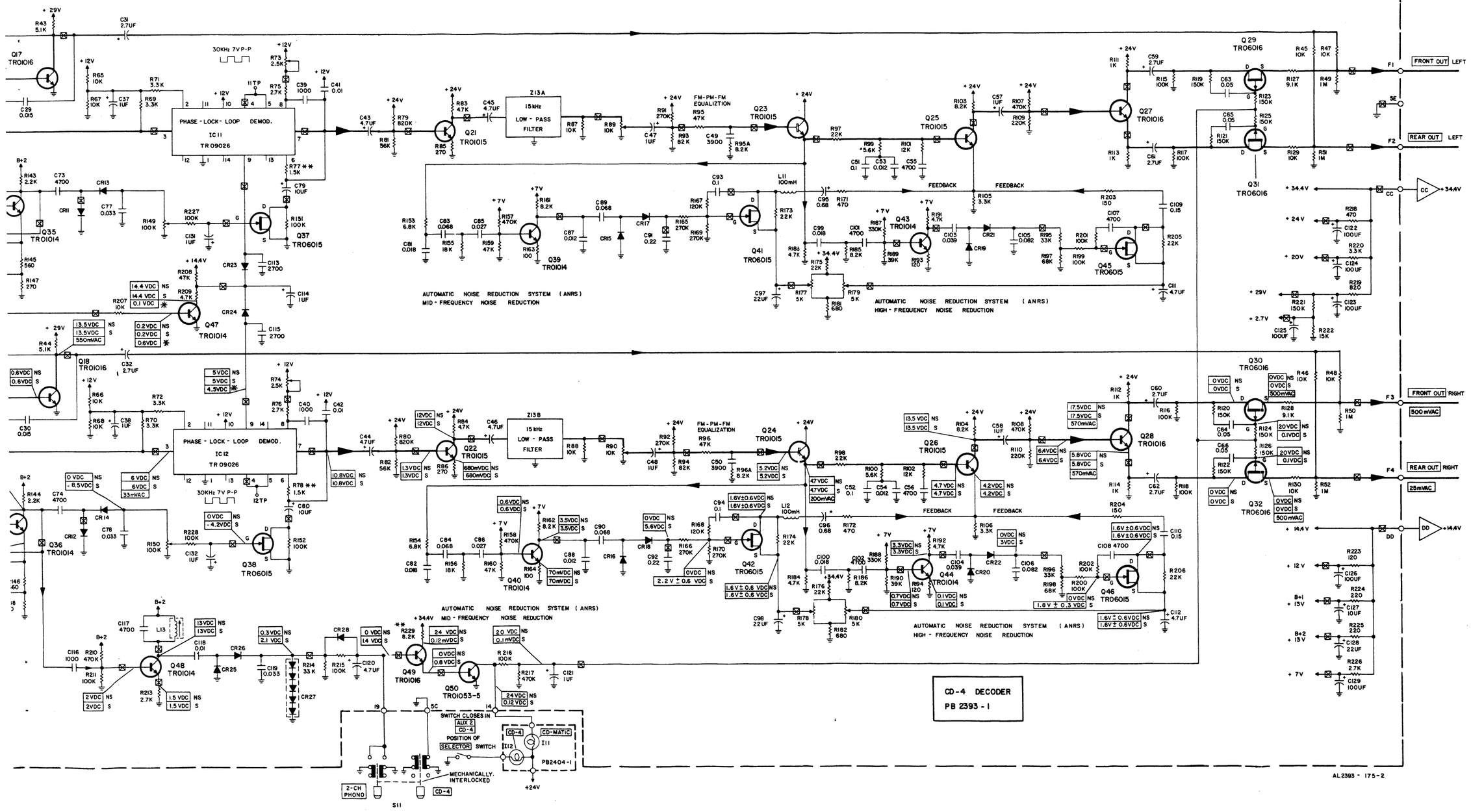
VCO WAVEFORM



NOTES :

1. LINE VOLTAGE SET TO 120 VAC FOR ALL VOLTAGE MEASUREMENTS. EXCEPT AS NOTED, ALL VOLTAGES ± 20%
2. XXXDC NS DENOTES DC VOLTAGES MEASURED WITH DC VTVM TO CHASSIS WITH NO INPUT SIGNAL
3. XXXDC S DENOTES DC VOLTAGES MEASURED WITH DC VTVM TO CHASSIS WITH INPUT SIGNALS AS SPECIFIED IN NOTE 5.
4. XXXDC * DENOTES DISABLING VOLTAGE WITH SELECTOR SWITCH SET TO AM OR FM.
5. XXXAC DENOTES 1kHz SIGNAL LEVELS MEASURED WITH AC VTVM TO CHASSIS WITH COMPOSITE INPUT SIGNALS AS FOLLOWS :
   BASE-CH LEVEL 2.8 mV AT 1kHz
   SUB-CH LEVEL 1.5 mV 30 kHz, ±2.2 kHz DEV., AT 1kHz
6. ☒ DENOTES TEST PADS USED FOR PRODUCTION TESTING.
7. ** DENOTES COMPONENTS MOUNTED ON UNDERSIDE OF PC BOARD.

CD-4 DEMODULATOR 2393-1



MAIN CHASSIS

SYMBOL	DESCRIPTION	PART NUMBER
	PANEL	
--	Knob, TUNING	EK20042-1
--	Knob, MASTER BALANCE	EK20044
--	Knob, Pushbutton	EK20046-3
--	Knob, Slide	EK20043-1
--	Knob, Rotary	EK20041-1
--	*Dress Panel Assembly (404X)	AS4144-124
--	**Dress Panel Assembly (414)	AS4144-123
--	*Nameplate (404X)	NP22653-2
--	**Nameplate (414)	NP22653-7
--	Insert, Upper (Window)	AD23096-2
--	Spring, Window retainer	AN51427
	Insert, Lower	AD23095-1
	Bushing, pushbutton	EA51413
	End Strip, Right	AD23065-4
	End Strip, Left	AD23065-3
CR505	LED - STEREO BEACON	TR19001
I1, 2,3,4	Lamp, Dial	LM21434
I5, 6	Lamp, Meter	AS21410-6
I7,8,9,10, 11,12,13, 14,15	Lamp, Indicator	LM21421-7
M1	Meter, Center-of-Channel	MC21619
M2	Meter, Signal Indicator	MC21620
--	Mounting Pad, Meter	EM21126
--	Tuning Shaft/Bushing Assembly	AS20729-1
--	Dial Pointer	AP20509-2A
--	Dial Glass (Acrylic)	AS4093-123-1
R124A, B	Control, MIDRANGE	RP50160-286
R132A,B, 133A,B	Control, FRONT/REAR BASS FRONT/REAR TREBLE	RP50160-285
R297A, B	Control, MASTER BALANCE	RP50160-307
--	Bezel, MASTER BALANCE	EA4094-136
R298, A,B, C, D	Control, MASTER VOLUME	RP50160-287
S1	Switch, POWER	SP50200-65
S1+	Switch, POWER	SP50200-64
S11	Switch, SELECTOR	SR4094-150
S81	Switch, MODE/MONITOR	SR4094-154
S275, 277, 278	3 Switch Assembly SQ DECODER, FM MUTING OFF, FM NOISE FILTER	SP50200-61
S283, 284, 285	3 Switch Assembly LOW FILTER, LOUDNESS, HIGH FILTER	SP50200-57
S866	Switch, SPEAKERS	SR4093-150
--	Jack TO RCDR, PHONES	JK20627-5
	**Control CD4 (414)	RP50160-317
	**Switch 2PB, CD4 (414)	SP50200-73-1
	**Connector, 2 Jack (414)	J50608
	CHASSIS REAR	
--	Connector,22 Jack,Female	JK20696
--	Terminal Strip, Antenna	ET51329
--	Terminal Strip, Speakers	ET51340-1DX
--	Connector, Single Jack,Female	J50465
J1	AC Outlet	JK20665
--	Line Cord	W50023-1
--	Strain Relief	EM21116-7
--	Fuse Holder	EA51408
--	+Line Cord (3 Conductor)	WR20678
--	+Strain Relief	E51110
S2	+Switch, Fused Voltage Selector	SR51304-1
	Cover, Output Transistor	AM2155-113
	BOARDS	
--	PCB AM FM Tuner	PB2301-1
--	+PCB AM FM Tuner	PB2301-2
--	PCB SQ Decoder	PB2302-1
--	PCB Preamplifier	PB2303-1
--	PCB Control Amplifier	PB2304-2
--	PCB Power Supply	PB2305-13
--	+PCB Power Supply	PB2305-14
--	+PCB Power Supply	PB2305-18
--	PCB Phones	PB2315-1
--	PCB Dial Lamp	PB2316-1
--	PCB Switch Board	PB2322-2
--	PCB Switch Board	PB2323-2
--	PCB Mode Lamp	PB2326-1
--	PCB Selector Lamp	PB2328-1
--	PCB Power Amplifier	PB2370-2
--	**PCB Lamps (414)	PB2404-1
--	PCB Tuner Load	PB2410-1

SYMBOL	DESCRIPTION	PART NUMBER
--	**PCB CD4 Decoder (414)	PB2393-1
	MISCELLANEOUS	
--	Cabinet Assembly	AS4145-131
	Cabinet (only)	KK4145-130
	Grille, Cabinet	EA51406
	Foot, Plastic	E51172
	Cover Bottom	AA4094-119
	Mounting Pad, Cover	EM51293
T1	Transformer, Power	TD4093-114
T1 +	Transformer, Power	TE4093-216
L300	Antenna AM Ferrite	AS4094-160
--	Bracket, AM Antenna Support	EA24006
--	Dial Drum Assembly	AS4094-166
--	Connector 12 Pin Male-Male	HH20686-12
--	Coupling, Extension Shaft	H50799

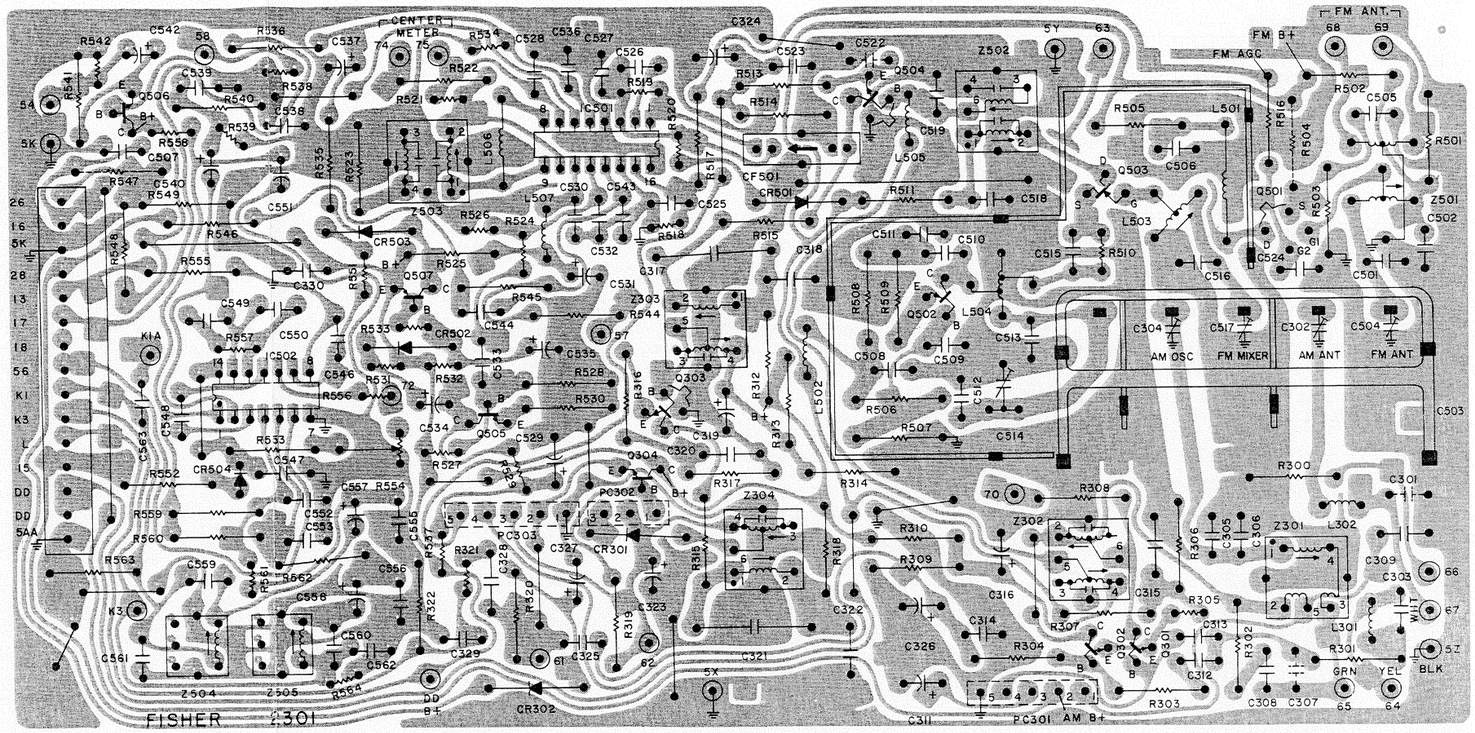
\+ Used in Export Units
* Used in Model 404X
** Used in Model 414

CONTROL AMPLIFIER 2304-2

SYMBOL	DESCRIPTION	PART NUMBER
C101, 102, 103, 104, 111, 112	Sintered Aluminum, 0.33UF, 25V	CS22340-3
C105, 106, 121, 122, 123, 124	Tantalum, 4UF 35V	CL22305-14
C107, 108, 109, 110	Tantalum, 1UF, 35V	CL22305-3
C113, 114	Ceramic, 820pF, 10%, 50V	CK22347-11
C117, 118, 119, 120	Sintered Aluminum, 1UF, 25V	CS22340-5
L101, 102	Choke, 39mH	L50334-11
PC101,102	Encapsulated Circuit	EP50187-87
Q101, 102, 103, 104	Transistor, NPN (BC414C)	TR01015
Q105, 106	Transistor, NPN (BC414B)	TR01015-2
Q107, 108	Transistor, NPN (BC147B)	TRBC147B
R81, 82, 83, 84	22K	RF25DC223J
R85, 86, 87, 88, 89, 90, 91, 92	56K	RF25DC563J
R101, 102, 103, 104	2.2K	RF25DC222J
R105, 106, 107, 108	270K	RF25DC274J
R109, 110, 111, 112	82K	RF25DC823J
R113, 114, 115, 116	1.8K	RF25DC182J
R117, 118, 119, 120	1K	RF25DC102J
R124A, B	Potentiometer, 20K Dual-Slide	RP50160-286
R126, 127	330	RF25DC331J
R128, 129	1M	RF25DC105J
R132A, B, 138A, B	Potentiometer, 200K Dual-Slide	RP50160-285
R134, 135	330K	RF25DC334J
R140, 141, 142, 143	1.2M	RF25DC125J
R144, 145, 146, 147	4.7K	RF25DC472J
R148, 149, 150, 151	27K	RF25DC273J
S81	Switch, MODE/MONITOR	SR4094-154
--	Connector, 6-Pin Male	HH20685-6
--	Connector, 6-Pin Female	HH20683-6

Resistors are Deposited Film, 5%, 1/4W. K=Kilohm M=Megohm

Symbol	Description	Part Number	Sug. Ret.
C301, 501, 516	Ceramic, 5pF, 5%, N750, 50V	CK22344-35	.30
C302	p/o C503		
C303	Ceramic, 39pF, N330, 50V	CK22344-22	.30
C304	p/o C503		
C305	Ceramic, 4pF, ±0.25pF, N750, 50V	CK22346-8	.30
C306	Ceramic, 15pF, 5%, N750, 50V	CK22344-2	.30
C308	Ceramic, 270pF, 10%, 50V	CK22350-5	.30
C309, 318, 322	Mylar, 0.1UF, 10%, 160V	C50B646-4	.45
C311, 316, 323, 326, 529	Electrolytic, 47UF, 16V	CE22342-8	.40
C312, 313, 314, 330, 523, 524, 527, 532	Ceramic, 0.02UF, +80-20%, 50V	CK22354-2	.30
C315	Mylar, 0.022UF, 10%, 160V	C50B647-9	.40
C317, 321	Polystyrene, 2200pF, 5%, 33V	C51B256-30	.45
C319, 327	Electrolytic, 10UF, 50V	CE22342-4	.35
C320	Ceramic, 0.1UF, +80-20%, 50V	CK22354-3	.35
C324	Electrolytic, 22UF, 35V	CE22342-6	.40
C328	Ceramic, 0.02UF, 20%, 50V	CK22349-3	.30
C331, 549	Mylar, 0.47UF, 10%, 50V	CY22356-13	.75
C502, 505, 507, 508, 515, 518, 526, 528, 530, 536, 544	Ceramic, 0.01UF, +80-20%, 50V	CK22354-1	.30
C503A, B, C, D, E	Tuning Gang Assembly	CV21013	5.70
C504	p/o C503		
C506, 509, 522, 525, 539, 543	Ceramic, 1000pF, 10%, 50V	CK22350-12	.30
C510	Ceramic, 12pF, 5%, NPO, 50V	CK22344-6	.30
C511	Ceramic, 8pF, 5%, NPO, 50V	CK22344-5	.30
C513	Ceramic, 5pF, ±0.25pF, N1500	CT22336-10	.40
C514	Trimmer, 1-6pF	C50B938-5	.75
C517	p/o C503		
C519	Silvered Mica, 330pF, 5%, 50V	CA22313-6	.45
C531, 535, 540, 542	Electrolytic, 4.7UF, 50V	CE22342-3	.35
C533	Ceramic, 0.1UF, +80-20%, 12V	CK22315-2	.50
C534, 537	Electrolytic, 1UF, 50V	CE22342-2	.35
C538	Ceramic, 220pF, 10%, 50V	CK22350-4	.30
C546, 550	Mylar, 0.22UF, 10%, 50V	CY22356-12	.60
C547	Silvered Mica, 470pF, 5%, 50V	CA22313-1	.45
C548	Ceramic, 0.05UF, +80-20%, 16V	CK22315-1	.50
C551	Electrolytic, 100UF, 16V	CE22342-12	.40
C552, 553	Mylar, 0.015UF, 5%, 50V	CY22356-5	.50
	Mylar, 0.01UF, 5%, 50V	CY22356-4	.45
C554	Ceramic, 1000pF, 10%, 50V	CK22358-12	.30
C557, 558	Electrolytic, 0.47UF, 50V	CE22342-1	.35
C559, 560	Silvered Mica, 330pF, 1%, 50V	CA22313-31	.60
C563	Ceramic, 3300pF, 20%, 50V	CK22349-5	.30
CF501	Filter, 10.7MHz Ceramic	ZK22110	4.20
CR301	Diode, Germanium (AA119)	TR12001-4	.50
CR302, 501, 502, 503, 504	Diode, Silicon	TR13006-2	.35
CR505	Light Emitting Diode	TR19001	1.40
IC501	I.C., FM IF	TR09018	6.65
IC502	I.C., MPX Demodulator	TR09019	11.25
L300	Antenna, AM Ferrite	AS4094-160	2.95
L301, 302, 500, 502, 507	Choke, 3.3UH	LC21814-2	.35
L501	Choke, 1.2UH	LC21822-2	.50
L503	Coil, FM Mixer	L21B811	.75
L504	Coil, FM Oscillator	LC21816	.90
L505	Choke, 10UH	L50B848-6	.50
L506	Choke, 22UH	L50B848-18	.65
M1	Signal Meter	MC21620	3.90



AL2301-111

Symbol	Description	Part Number	Sug. Ret.
M2	Center-of-Ch Meter	MC21619EX	3.90
PC301	Encapsulated Bias Network	EP50187-86	.85
PC302	Encapsulated 455kHz Filter	PC50B187-62	.85
PC303	Encapsulated Bias/Audio Network	PC50B187-60	.80
Q301, 302	Transistor, NPN (A494/BF194)	TR01027	1.00
Q303	Transistor, NPN (BF199 or A473/BF173) or	TR01074 TR01026	1.00 1.15
Q304, 505, 506	Transistor, NPN (BC239C)	TR01014	.70
Q501	Transistor, Dual-Gate MOSFET	TR08004	1.45
Q502	Transistor, PNP (SPS871)	TR02012	.95
Q503	Transistor, N-Channel FET	TR06014	1.80
Q504	Transistor, NPN (BF198 or A467/BF167) or	TR01073 TR01042	1.00 1.40
Q507	Transistor, PNP (2N4250)	TR02020-2	.55
R300	330K	RF25DC334J	.30
R301	68	RF25DC680J	.30
R302, 314	1.5K	RF25DC152J	.30
R303	47	RF25DC470J	.30
R304, 559, 560	6.8K	RF25DC682J	.30
R305	5.6	RF25DC5R6J	.30
R306, 506	2.2K	RF25DC222J	.30
R307, 546	15K	RF25DC153J	.30
R308, 319, 517, 531, 532, 535, 544	100K	RF25DC104J	.30
R309, 514	820	RF25DC821J	.30

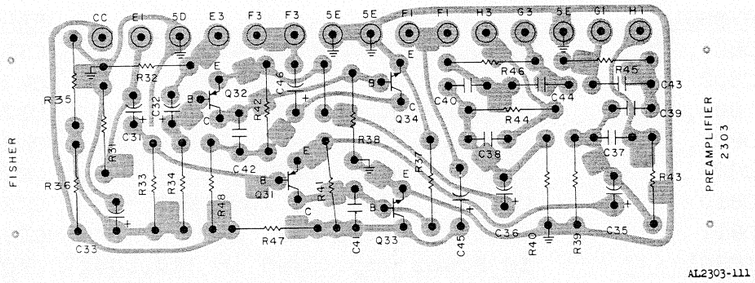
Symbol	Description	Part Number	Sug. Ret.
R310, 541	2.7K	RF25DC272J	.30
R311, 317, 536, 557	1K	RF25DC102J	.30
R312, 318 515, 519, 524	470	RF25DC471J	.30
R313, 510	4.7K	RF25DC472J	.30
R315, 503, 525	100	RF25DC101J	.30
R316, 323, 513, 530	22	RF25DC220J	.30
R320	18K	RF25DC183J	.30
R321	82K	RF25DC823J	.30
R501, 518, 528, 533, 545	10K	RF25DC103J	.30
R502, 539, 551	220K	RF25DC224J	.30
R505, 511, 537	220	RF25DC221J	.30
R507, 529	3.9K	RF25DC392J	.30
R508	1.2K	RF25DC122J	.30
R509	150	RF25DC151J	.30
R516, 538	150K	RF25DC154J	.30
R520	33K	RF25DC333J	.30
R521	5.6K	RF25DC562J	.30
R522, 542, 556, 561, 562	22K	RF25DC223J	.30

Symbol	Description	Part Number	Sug. Ret.
R523	3.3K	RF25DC332J	.30
R526	12K	RF25DC123J	.30
R527	200K	RF25DC204J	.30
R534	39K	RF25DC393J	.30
R540, 549	8.2K	RF25DC822J	.30
R548, 555	120K	RF25DC124J	.30
R552	47K	RF25DC473J	.30
R553	16K	RF25DC163J	.30
R554	Variable, 5K, 20%	RV50150-23-3	.60
R558	180	RF25DC181J	.30
R565	Composition, 680, ½W	RC20BF681J	.35
S277, 278	p/o 4-Switch Assembly	SP50200-60	3.45
Z301	Coil, AM Oscillator	ZZ50210-181	1.20
Z302	Transformer, 455kHz IF	ZZ50210-161	2.00
Z303	Transformer, 455kHz IF	ZZ50210-156	1.75
Z304	Transformer, 455kHz IF	ZZ50210-159	1.75
Z501	Coil, FM Antenna	L21B808	1.45
Z502	Transformer, 10.7MHz IF	ZZ50210-178	1.35
Z503	Transformer, 10.7MHz IF	ZZ50210-180	1.35
Z504, 505	Coil, 38kHz Trap	ZZ50210-169	.85
- -	Dial Drum Assembly	AS4094-166	.95
- -	Connector, 15-Pin Male	HH20685-15	.85
- -	Connector, 15-Pin Female	HH20683-15	.75

*Used in PB2301-2 Export Tuner

Except as noted, resistors are Deposited Film, 5%, ¼W. K=Kilohm

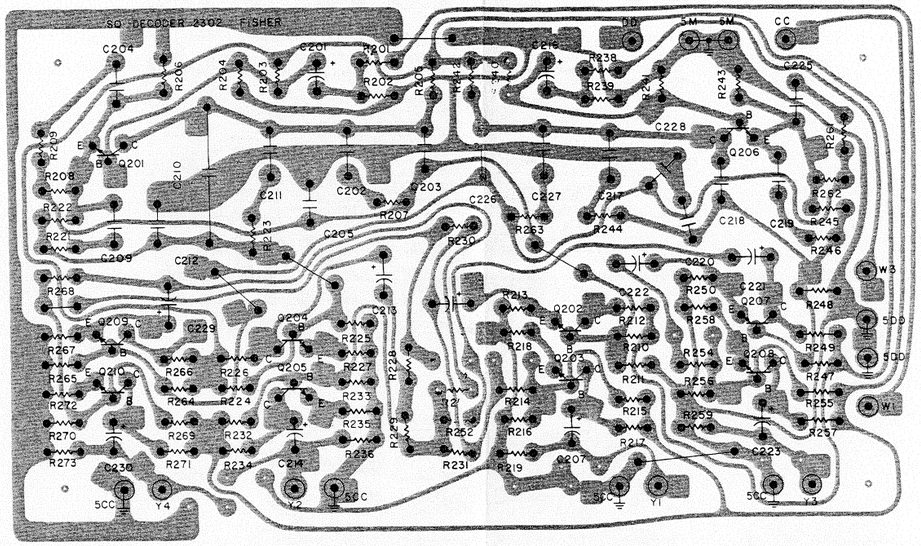
PREAMPLIFIER 2303-1



Symbol	Description	Part Number	Sug. Ret.
C11, 12, 13, 14, 15, 16	Ceramic, 470pF, 10%, 50V	CK22358-8	.30
C17, 18, 47, 48	Ceramic, 1000pF, 10%, 50V	CK22358-12	.30
C19	Ceramic, 5000pF, 10%, 50V	CK22355-2	.30
C31, 32	Tantalum, 0.68UF, 35V	CL22306-2	.75
C33	Electrolytic, 220UF, 10V	CE22342-16	.40
C35, 36	Electrolytic, 10UF, 50V	CE22342-4	.35
C37, 38	Ceramic, 120pF, 10%, 50V	CK22350-1	.30
C39, 40	Ceramic, 5000pF, 20%, 50V	CK22349-2	.30
C41, 42	Ceramic, 5pF, 5%, NP0, 50V	CK22344-1	.30
C43, 44	Ceramic, 1500pF, 10%, 50V	CK22351-8	.30
C45, 46	Tantalum, 2.7UF, 35V	CL22305-4	.75
C375	Electrolytic, 4.7UF, 50V	CE22342-3	.35
C376	Electrolytic, 1UF, 50V	CE22342-2	.35
C377	Ceramic, 0.02UF, 20%	CK22349-3	.30
C378	Ceramic, 2200pF, 10%	CK22347-15	.30
CR375	Diode, Varactor	TR17001-5	1.05
I11, 12, 13, 14	Lamp, Sub-Miniature	LM21421-4	.70
Q31, 32	Transistor, PNP (2N4250)	TR02020-2	.55
Q33, 34	Transistor, NPN (BC414C)	TR01015	.85
Q375	Transistor, NPN (BC239C)	TR01014	.70
R11, 12	1.5K	RF25DC152J	.30
R13, 14, 15, 16, 36	100K	RF25DC104J	.30
R17, 18, 19, 20	1K	RF25DC102J	.30
R21, 22, 23, 24, 380	5.6K	RF25DC562J	.30
R25, 26	6.8K	RF25DC682J	.30
R27	3.9K	RF25DC392J	.30
R31, 32, 37, 38	82K	RF25DC823J	.30
R33, 34	120K	RF25DC124J	.30
R35, 47, 48, 377, 378	10K	RF25DC103J	.30
R39, 40	820	RF25DC821J	.30
R41, 42, 49, 50	1M	RF25DC105J	.30
R43, 44	18K	RF25DC183J	.30
R45, 46	56K	RF25DC563J	.30
R375	680	RF25DC681J	.30
R376	47K	RF25DC473J	.30
R379	15K	RF25DC153J	.30
R381	510	RF25DC511J	.30
R382, 383	33K	RF25DC333J	.30
S11	Switch, SELECTOR	SR4094-150	7.50
S286	p/o 4-Switch Assembly	SP50200-59	3.45

Resistors are deposited Film, 5%, ¼W. K=Kilohm M=Megohm

SQ DECODER 2302-1

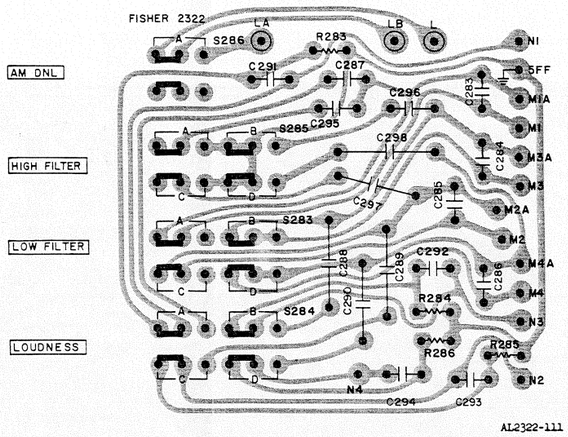


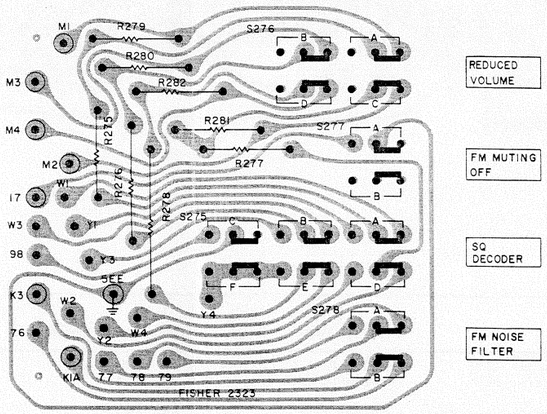
Symbol	Description	Part Number	Sug. Ret.
C201, 216	Electrolytic, 4.7UF, 50V	CE22342-3	.35
C202, 211, 217, 227	Mylar, 0.1UF, 5%, 160V	C50B646-9	.45
C203, 218	Polystyrene, 2500pF, 5%, 33V	C51B256-37	.45
C204, 219	Mylar, 31400pF, 5%, 50V	CY22356-7	.50
C205, 220	Polystyrene, 3300pF, 5%, 33V	C51B256-21	.45
C206, 213, 221, 222, 229	Electrolytic, 10UF, 50V	CE22342-4	.35
C207, 214, 223, 230	Tantalum, 1UF, 35V	CL22305-3	.60
C208	Electrolytic, 220UF, 16V	CE22342-15	.40
C209, 225	Mylar, 44180pF, 5%, 50V	CY22356-8	.50
C210, 226	Polystyrene, 6800pF, 5%, 33V	C51B256-25	.50
C212, 228	Polystyrene, 0.018UF, 5%, 33V	C51B256-38	.70
I8	Lamp, Sub-Miniature	LM21421-4	.70
Q201, 202, 204, 206, 207, 209	Transistor, NPN (BC239C)	TR01014	.70
Q203, 205, 208, 210	Transistor, NPN (BC147B)	TRBC147B	1.00
R201, 211, 238, 248	27K	RF25DC273J	.30
R202, 239	470K	RF25DC474J	.30
R203, 219, 236, 240, 259, 273	100K	RF25DC104J	.30
R204, 208, 241, 245	47K	RF25DC473J	.30

Symbol	Description	Part Number	Sug. Ret.
R205, 206, 212, 213, 242, 243, 249, 250, 266	470	RF25DC471J	.30
R207, 244	7.5K	RF25DC752J	.30
R209, 246	3.3K	RF25DC332J	.30
R210, 247	68K	RF25DC683J	.30
R214, 216, 254, 256	10K	RF25DC103J	.30
R215, 255	200K	RF25DC204J	.30
R217, 234, 257, 271	5.6K	RF25DC562J	.30
R218, 235, 258, 272	220	RF25DC221J	.30
R221, 261	5.1K	RF25DC512J	.30
R222, 262	220K	RF25DC224J	.30
R223, 263	16K	RF25DC163J	.30
R224, 264	330K	RF25DC334J	.30
R225, 265	120K	RF25DC124J	.30
R226, 267	1K	RF25DC102J	.30
R227	910	RF25DC911J	.30
R228, 231, 251, 253	22K	RF25DC223J	.30
R229, 230, 252, 268	8.2K	RF25DC822J	.30
R232, 269	820K	RF25DC824J	.30
R233, 270	56K	RF25DC563J	.30
S275	p/o 4-Switch Assembly	SP50200-60	3.45

Resistors are Deposited Film, 5%, ¼W. K=Kilohm

SWITCH BOARDS 2322-1/2323-1





Symbol	Description	Part Number	Sug. Ret.
C283, 284, 285, 286	Mylar, 0.1UF, 10%, 250V	C50B575-1	.50
C287, 288, 289, 290	Ceramic, 680pF, 10%, 50V	CK22358-10	.30
C291, 292, 293, 294	Mylar, 0.22UF, 10%, 250V	C50B575-2	.60
C295, 296, 297, 298	Mylar, 0.015UF, 10%, 100V	C50B574-2	.40
R275, 276, 277, 278	4.7K	RF25DC472J	.30
R279, 280 281, 282	150K	RF25DC154J	.30
R283, 284, 285, 286	2.7K	RF25DC272J	.30
R297A, B, C, D	Control, MASTER BALANCE	RP50160-289	10.30
R298A, B, C, D	Control, MASTER VOLUME	RP50160-287	7.10
S276	p/o 4-Switch Assembly	SP50200-60	3.45
S283, 284, 285	p/o 4-Switch Assembly	SP50200-59	3.45
--	Jack, TO RCDR-FRONT, REAR	JK20627-5	1.10

Resistors are Deposited Film, 5%, ¼W. K=Kilohm

POWER AMPLIFIER MODEL PB2370-2

SYMBOL	DESCRIPTION	PART NUMBER
C801, 803	Sintered Aluminum, 4.7UF,25V	CS22340-6B
C802	Ceramic,1800pF 10%, 50V	CK22347-14A
C804, 808	Electrolytic,10UF, 50V	CE22342-4
C806, 812	Ceramic,0.1UF, +80 -20%, 100V	CK22362-3
C807	Electrolytic, 220UF, 25V	CE22342-14
C810	Ceramic,10pF 10% 100V NPO	CK22360-3
C811	Electrolytic,47UF, 35V	CE22342-14
IC801	IC Power Amp.(used in 314,304X)	TR09021AX
IC801	IC Power Amp.(used in 414,404X)	TR09022AX
Q801	Transistor,NPN (BC239C)	TR01014A
R801	10K	RF25DC103J
R802	1M	RF25DC105J
R803	5.6K	RF25DC562J
R804	1.8M , 5% 1/2W.	R50DC185J
R805	1K	RF25DC102J
R806	10Ω	RF25DC100J
R807	220K	RF25DC224J
R808	220Ω	RF25DC221J

Resistors are Deposited Film, 5% 1/4W, Except as noted
K=Kilohm M=Megohm

POWER SUPPLY 2305-3, -13

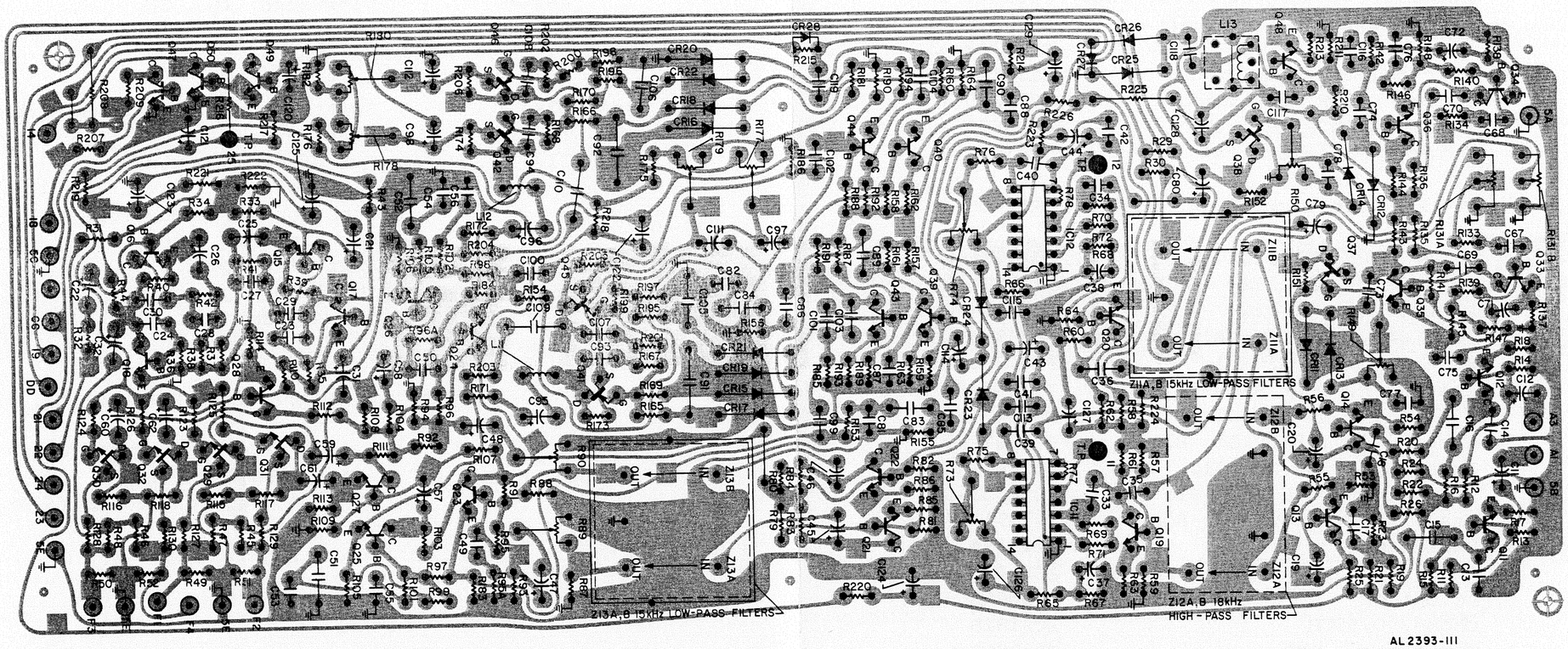
SYMBOL	DESCRIPTION	PART NUMBER
C901	Ceramic, 330pF, +80-20%	CK22352-3
C901+	Ceramic, 300pF, 400VAC	C51164-1
C902, 903, 904, 905, 908, 909	Ceramic, 0.02UF, 20% 500V	CK22359-3
C906, 907	Electrolytic, 8000UF, 50V	CE22357-2
C910	Electrolytic, 470UF, 100V	CE22343-44
C911	Electrolytic, 1000UF, 50V	CE22343-36
C912	Ceramic, 0.01UF, +80-20%, 100V	C50B570-1
C913	Electrolytic, 470UF, 50V	CE22343-33
C914	Electrolytic, 100UF, 100V	CE22343-43
C915	Electrolytic, 100UF, 25V	CE22343-26
C916	Mylar, 0.1UF, 20% 250V	C50B575-1
C917	Mylar, 0.22UF, 10% 250V	C50B575-2
CR901A,B, C, D	Bridge Rectifier, 25A, 200V	BR51401-2
CR902A,B, C, D	Bridge Rectifier, 1.5A, 200V	BR51400-1
CR903A	Zener, 20V, 3%, 1W	TR14001-4
CR903B	Zener, 15V, 3%, 1W	TR14001-2
CR904*	Zener, 24V, 5%, 3W	TR14001-1
F901*	Fuse 6A, 125V, Slo-Blo	FL51313-25
F901**	Fuse 4A, 125V Slo-Blo	FL51313-12
F901+*	Fuse 6.3A, 250V Slo-Blo	F51247-24
F901**+	Fuse 4A, 250V Slo-Blo	F51247-22
F901+*	Fuse, 3.15A, 250V Slo-Blo	F51247-20
F901**+	Fuse, 2A, 250V Slo-Blo	F51247-18
F902, 903	Fuse, 10A, 250V, Slo-Blo	FL51313-22
F904	Fuse, 3/4A, 250V, Slo-Blo	FL51313-7
I1, 2,3,4	Dial Lamp	LM21434
I5,6	Lamp,Meter-Signal,Center-of-Ch.	AS21410-6
J1	AC Outlet	JK20665
L901	Choke, 0.55UH	LC21818
Q901	Transistor, PNP	TR02062-6
Q902, 903	Transistor, NPN	TR01045
R901	Composition, 820K, 10%	RC20BF824K
R902, 903	Deposited Film 220	R50DC221J
R904	Wirewound, 0.51, 2W	RW200WR51J

SYMBOL	DESCRIPTION	PART NUMBER
R905	Wirewound, 150, 10W	RP10W151J
R906	Wirewound, 100, 2W	RW200W101J
R907	Deposited Film, 22K	R50DC223J
R908*	Wirewound, 150, 5W	RP5W151J
R908**	Wirewound, 100, 5W	RP5W101J
R909*	Deposited Film 680	R50DC681J
R909**	Deposited Film 1K	R50DC102J
R910	Deposited Film 47K	R50DC473J
R911	Deposited Film 10K	R50DC103J
R912	Composition, 510	RC20BF511J
R913	Composition, 47	RC20BF470J
R914*	Wirewound, 100, 3W	RW3W101J
R914**	Wirewound, 56, 3W	RW3W560J
S1	Switch, POWER	SP 50200-65
S1+	Switch, POWER	SP50200-64
S2+	Switch, Fused Voltage Selector	SR51304-1
T1	Transformer, Power	TD4093-114
T1+	Transformer, Power	TE4093-216
--	Line Cord	W50023-1
--	*Line Cord (3-Conductor)	WR20678
--	Mounting Pad, Q901	A50618
--	Heat Sink, Q901	A50B842-5
--	Insulator, Q902, 903	E20413-3
--	Fuse Holder	EA51408

Except as noted, resistors are 5%, 1/2W. K=Kilohm

\+ Used in Export Units
* Used in 2305-3 (404)
** Used in 2305-13 (404X, 414)

CD-4 DEMODULATOR PB 2393-1



CD-4 DEMODULATOR 2393-1

SYMBOL	DESCRIPTION	PART NUMBER
C11, 12	Tantalum, 1 UF, 35V	CL22305-3
21, 22,		
57, 58		
131, 132		
C13, 14	Ceramic, 21 pF, 10%, 50V	CK22345-15
17, 18,		
23, 24,		
69, 70		
C15, 16	0.1 UF	CY22335-18
51, 52,		
75, 76,		
93, 94		
C19, 20,	Electrolytic, 4.7 UF, 50V	CE22342-3
43, 44,		
45, 46,		
111, 112		
C25, 26	Tantalum, 10 UF, 25V	CL22305-17
C27, 28	6800 pF	CY22335-9
C29, 30	0.015 UF	CY22335-2
C31, 32,	Tantalum, 2.7 UF, 35V	CL22305-4
59, 60,		
61, 62		
C33, 34,	4700 pF	CY22335-8
35, 36,		
55, 56,		
73, 74,		
101, 102		
107, 108,		
117		
C113, 115	2700 pF	CY22335-6
C116	1000 pF	CY22335-3
C120	Tantalum, 4.7 UF, 25V	CL22305-6
C122, 123,	Electrolytic, 100 UF, 35V	CE22342-10
124, 126		
C125, 129	Electrolytic, 100 UF, 16V	CE22342-12
CR11, 12	Diode, Germanium	TR12001-4
13, 14		

SYMBOL	DESCRIPTION	PART NUMBER
CR15, 16	Diode, Silicon	TR13006-2
17, 18,		
19, 20,		
21, 22,		
23, 24,		
25, 26,		
28		
CR27	Stabister Module, Silicon	SIT51096-6
IC11, 12	FM Demodulator, Phase-Lock-Loop	TR09026
L11, 12	Inductor, Audio, 100 mH	LC21834-1
L13	Coil, Adjustable	ZZ50210-185
Q11, 12	Transistor, NPN (BC414C)	TR01015
13, 14,		
21, 22		
23, 24,		
25, 26		
Q15, 16	Transistor, PNP	TR02020-2
Q17, 18,	Transistor, NPN	TR01016
Q27, 28,		
49		
Q19, 20,	Transistor, NPN (BC239C)	TR01014
33, 34,		
35, 36,		
39, 40,		
43, 44,		
47, 48		
Q29, 30,	Transistor, P-Channel FET	TR06016
31, 32		
Q37, 38,	Transistor, N-Channel FET	TR06015
41, 42,		
45, 46		
Q50	Transistor, NPN	TR01053-5
R11, 12,	1.5M	RB25DC155J
13, 14,		
115, 116,		
117, 118,		
139, 140,		

CD-4 DEMODULATOR 2393-1

SYMBOL	DESCRIPTION	PART NUMBER
151, 152		
199, 200,		
201, 202,		
211		
R15, 16,	47K	RB25DC473J
95, 96,		
135, 136,		
159, 160		
R17, 18,	2.7K	RB25DC272J
59, 60,		
213, 226		
R19, 20,	4.7K	RB25DC472J
25, 26,		
61, 62,		
83, 84,		
183, 184,		
191, 192,		
209		
R21, 22	430K	RB25DC434J
23, 24,	56K	RB25DC563J
81, 82		
R29, 30	10K	RB25DC103J
45, 46,		
47, 48,		
65, 66,		
67, 68,		
87, 88,		
129, 130,		
133, 134,		
207		
R31, 32,	1K	RB25DC102J
111, 112,		
113, 114		
R33, 34,	120K	RB25DC124J
167, 168		

SYMBOL	DESCRIPTION	PART NUMBER
R35, 36,	12K	RB25DC123J
41, 42,		
101, 102		
R37, 38	1.2K	RB25DC122J
R39, 40	180K	RB25DC184J
R43, 44	5.1K	RB25DC512J
R49, 50,	1M	RB25DC105J
51, 52,		
R53, 54	820	RB25DC821J
R55, 56,	2.2K	RB25DC222J
143, 144		
R57, 58,	33K	RB25DC333J
195, 196,		
214		
R63, 64	220	RB25DC221J
R69, 70,	3.3K	RB25DC332J
71, 72		
105, 106		
R73, 74	Potentiometer, 2.5K, 20%	RV50150-23-2
R75, 76	Composition, 2.7K, 5%, 1/4W	RC07BF272J
R77*, 78*	1.5K (Insulated Leads)	RF25DC152J
R79, 80	820K	RB25DC824J
R85, 86,	270	RB25DC271J
147, 148,		
R89, 90	Potentiometer, 10K, 20%	RV50150-23-7
R91, 92,	270K	RB25DC274J
165, 166,		
169, 170,		
R93, 94	82K	RB25DC823J
R95A, 96A,	8.2K	RB25DC822J
103, 104,		
161, 162,		
185, 186,		

SYMBOL	DESCRIPTION	PART NUMBER
R97, 98	22K	RB25DC223J
173, 174,		
175, 176,		
205, 206		
R99, 100	5.6K	RB25DC562J
R107, 108,	470K	RB25DC474J
157, 158,		
210, 217,		
R109, 110	220K	RB25DC224J
R119, 120,	150K (Insulated Leads)	RF25DC154J
121, 122,		
R123, 124,	150K	RB25DC154J
125, 126,		
221		
R127, 128	9.1K	RB25DC912J
R131A, 131B	Potentiometer, Dual 10K	RP50160-318
R137, 138	470	RB25DC471J
R141, 142,	68K	RB25DC683J
197, 198,		
R145, 146	560	RB25DC561J
R149, 150	Potentiometer, 5K, 20%	RV50150-23-8
R153, 154	6.8K	RB25DC682J
R155, 156	18K	RB25DC183J
R163, 164	100	RB25DC101J
R171, 172	470	RB25DC471J
R177, 178,	Potentiometer, 5K, 20%	RV50150-23-3
179, 180		
R181, 182	680	RB25DC681J
R187, 188	330K	RB25DC334J

CD-4 DEMODULATOR 2393-1

SYMBOL	DESCRIPTION	PART NUMBER
R189, 190	39K	RB25DC393J
R193, 194	120	RB25DC121J
R203, 204	150	RB25DC151J
R208	47K (Insulated Leads)	RF25DC473J
R215, 216,	100K (Insulated Leads)	RF25DC104J
227, 228		
R218	Wirewound, 470, 2W	RW200W471J
R219	Wirewound, 820, 2W	RW200W821J
R220	Composition, 3.3K, 5%, 1/2W	RC20BF332J
R222	15K	RB25DC153J
R223	Composition, 120, 5%, 1/2W	RC20BF121J
R224, 225	Composition, 220, 5%, 1/2W	RC20BF221J
R229*	8.2K (Insulated Leads)	RF25DC822J
Z11A, 11B	Filter, Dual, Low Pass	ZZ50210-193
Z13A, 13B		
Z12A, 12B	Filter, Dual, High Pass	ZZ50210-194

Unless otherwise specified:

Resistors are Deposited Carbon, 5%, 1/4W. K=Kilohm, M=Megohm

Capacitors are Mylar, 10%, 100V

* Denotes components mounted on underside of Board

CD-4 DISC DEMODULATOR CHASSIS

SYMBOL	DESCRIPTION	PART NUMBER
	PCB, CD-4 Disc Demodulator	PB2393-1
	Cable Assembly, REAR OUT	AS25011-1
	Cable Assembly, FRONT OUT	AS25011-2
	Connector, Double Jack, Female	J20608
R27, 28	Control, CD-4 SEPARATION LEFT, CD-4 SEPARATION RIGHT	RP50160-317
	Knob, Pushbutton	EK20046-3
	PCB, Lamp	PB2404-1
I11, 12	Lamp, CD-4, CD-MATIC	LM21421-7
	Lamp Housing	EA51461
	Strain Relief	EM21116-2
S11	2-Switch Assembly, 2 CH PHONO, CD-4	SP50200-73-1